

FLIGHT

The
AIRCRAFT ENGINEER
AND AIRSHIPS

Founded in 1909 by Stanley Spooner
*FIRST AERONAUTICAL
WEEKLY IN THE
WORLD*

DEVOTED TO THE INTERESTS,
PRACTICE AND PROGRESS
OF AVIATION

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

No. 1351. Vol. XXVI. 26th Year.

NOVEMBER 15, 1934

Thursdays, Price 6d.
By Post, 7½d.

Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1

Telegrams: Truditur, Watloo, London.

Telephone: Hop 3333 (50 lines).

HERTFORD ST., COVENTRY.

GUILDHALL BUILDINGS,

200, DEANSGATE, MANCHESTER 3.

26B, RENFIELD ST.,

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Telephone: Coventry 5210.

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SUBSCRIPTION
RATES:

Home and Canada: Year, £1 13 0. 6 months, 16s. 6d. 3 months, 8s. 3d.
Other Countries: Year, £1 15 0. 6 months, 17s. 6d. 3 months, 8s. 9d.

Modern Tendencies

FOR many years it has been the custom of *Flight* to publish, on the occasion of the Paris Aero Shows, the fourteenth of which is opening tomorrow, a section dealing with the British Aircraft Industry. From the review published this week the interesting fact emerges that twenty-seven aircraft firms are in existence, and that twenty-one of these firms produce between them sixty-four distinct types of aircraft. Of these, twenty-eight are civil types and thirty-two military, while four are training machines.

A few years ago a census of the proportion of civil to military types would have given very different results, and we see in the increasing number of civil aeroplanes an indication of the growing use of and demand for air travel. The overwhelming preponderance of the biplane type for military aircraft is commented upon elsewhere. Among the civil machines the ratio is reversed, and the monoplane has become the more popular, in the proportion of nineteen to seven.

Rumblings

THE Lord Mayor's Show of 1918 was held in an atmosphere of coming victory and peace. The Lord Mayor's Show of 1934 has been held in an atmosphere of war talk which is certainly depressing. The Prime Minister and the Secretary of State for Air both spoke at the Guildhall banquet, and the speeches of both were full of disappointment at the failure of the Disarmament Conference and the recent deterioration in the international situation. Mr. Churchill on the same day expatiated on the perilous situation and the danger to Great Britain. Mr. Lloyd George, a couple of days later, when opening an exhibition of war photographs, said that he was not one of those who thought that war was quite imminent, but he suggested, by means of a graphic suggestion of an in-

surance at Lloyd's, that he thought that war was probable within the next five or ten years. This harping on the same strain by four public men, some in office and some out, men representing the National Labour, the Conservative, and the Independent Liberal parties, is, to say the least of it, ominous.

Before the Great War, though many men uttered warnings, there had been peace in Europe (outside the Balkans) for so long that it seemed incredible to the average British citizen that a great European war could ever become an actual fact. We were then all dreaming a beautiful dream of peace, although a foreign war seemed a less unwholesome thing than were the quarrels in Ireland. Even though we experienced horrors previously unknown in those four awful years, we may still feel thankful that things never came to the still more horrible pass of fighting Ulster to drive her unwillingly into severance from the United Kingdom, or of facing a mutiny in our own Army.

Now no one disbelieves in the possibility of war. What has happened once can happen again. Yet it is strange that any section of European mankind should be even remotely willing to contemplate the possibility of attacking anyone else after the terrible experiences which all the combatants have gone through. War is not caused by the existence of armaments, but by some person or nation desiring to attack another nation in order to gain something. That any person or nation should have such a desire now, with the memories of the Great War still so poignant, is shocking to contemplate.

The Air as the Villain

ALL speakers and writers are agreed that the next war, if ever it comes, will be more horrible than the last. The air is always blamed for this prospect, though actually it is not the air by itself, but the possibility of chemical warfare used from the air, which is visualised by the speakers. Mr. Churchill said in the speech alluded to above that our greatest

and most immediate danger was from the air. Mr. Lloyd George said that children would be in the front line next time, liable to be killed and mutilated by the same bombs, and liable to be strangled with the same poisonous fumes as their parents.

We have often expressed our regret that the League of Nations has not put in the forefront of its programme a severe condemnation of chemical warfare and of deliberate attacks on civilian populations. There are cynics in plenty who say that it is no use to make such agreements because they are bound to be broken in time of war. Many times we have given reasons based on history for the belief that international rules of warfare, provided that they are sensibly framed and aim at avoiding atrocities but do not attempt to deprive a belligerent of his legitimate rights, are generally observed in war. It would be no use to forbid all bombing from the air, for that would be an unreasonable demand, and it would be disregarded at once by both sides. Reasonable rules are usually kept, partly from innate feelings of humanity, which still survive in most parts of Europe, and partly from fear of reprisals. Of course, if a nation becomes a criminal lunatic, either from the insolence which believes that no reprisals are possible or from desperation, then there is no foretelling what it will do. Nevertheless, an emphatic disavowal of chemical warfare and of deliberate attacks on civilians by the League of Nations would certainly have had great effect.

Britain's Duty

BEFORE 1914 one of the greatest influences for peace was the British Navy. Its unchallenged power averted not a few wars. In recent years Great Britain has been in no position to coerce peace. We have now decided to abandon the policy of helplessness, and it was since that determination was taken that the Prince of Wales remarked that the Royal Air Force, together with the Navy and the Army, "makes for confidence, not only throughout the Empire, but throughout the world—a confidence which is of vital importance, and will continue to be of vital importance until the make-up of the world changes very radically." A well-armed Britain makes for peace in the world, not for war.

Mr. Churchill drew attention to the reduced capacities of the firms which can make arms for our forces, and asserted that other nations are far ahead of us in this sort of preparedness. It is a serious matter. Our aircraft firms, in particular, ought to be in a position to increase their output at short notice if ever the need should arise. As the Government recognises that a strong Britain is an influence which makes for peace, it is the obvious duty of the Government to see to it that we are as strong as possible in this very vital element of strength.



THE SWASTIKA IN PARIS. A scene in the Grand Palais while preparations were being made for the opening of the Fourteenth International Aero Exhibition, which opens to-morrow. The machine in the foreground is a German Junkers. A forecast of the exhibits appears in this issue, on pages 1193 and 1194.

The Outlook

A Running Commentary on Air Topics

Speeds in America

ALTHOUGH there is a distinct tendency towards exaggeration when the relative speeds of British and American air lines are compared, there is little doubt that, with new equipment, the more important companies in the United States now have extremely high schedules.

Transcontinental and Western Air, for instance, cover the coast-to-coast journey in something like fifteen hours in the ordinary way—an inclusive average of 174 m.p.h. With Douglas DC.2's, Lockheed "Electras," and the big Sikorsky on the Pan-American route to South America, the times on the main trunk routes have been "cut to ribbons" during 1934.

By way of showing what can be accomplished on a special occasion, a Douglas was flown, last week, from Los Angeles to Newark, with only one stop at Kansas City, in very little over twelve hours—averaging 219 m.p.h. while flying at fairly high altitudes. Actually, in this instance the machine probably had a following wind.

Commercial Speed

THE figures given in the above paragraph do not alter the fact that since the England-Australia Race there has been a very large amount of loose and ill-informed writing appearing about speed in the air—how it ought to be used and how it can be obtained.

Most people seem to think that the question of whether high speed is commercial—that is, whether it can be made to pay or not—rests entirely with the aeroplane and has little to do with the route over which that aeroplane is operated. They forget that matters like the cost of fuel and the provision of ground organisation, without which no air line, fast or slow, can be run, vary considerably according to the part of the world in which that route lies.

The fact is these people do not stop to think about the true circumstances of the case, and assume that, because a well-organised crew runs a fast American aeroplane through the race, to a schedule which is many days shorter than our regular lines, we ought to do likewise, and do it every day. Actually, the factors affecting the feasibility of speed-increase in aircraft operation vary with every line and route. Some of these, like altitude and cost, are dealt with in this issue in a *precis* of a paper read before the Royal Aeronautical Society by M. Louis Breguet, the eminent French aircraft designer.

Mediterranean Mail Route

ONE of the advantages of the carriage of mails by air is that the widely separated parts of our Empire can thereby be linked more closely. Take, for example, Gibraltar and Malta. Both are almost entirely surrounded by water and dependent upon the mail for their touch with the outer world. Both are strategic points and, therefore, important to the unity of the Empire. An air mail service taking the route Southampton, Gibraltar, Malta, and Cairo or Alexandria and back would be a boon to those places and a valuable link in our communications.

Fast flying boats could do it, with Post Office support. Each stage, a distance of about 1,000 miles, could be made without stopping; and, even flying by day only, with boats cruising at no more than 100 m.p.h., it would be possible to get a letter to Malta in two days, or in twenty-four hours if flying were carried on through the night.

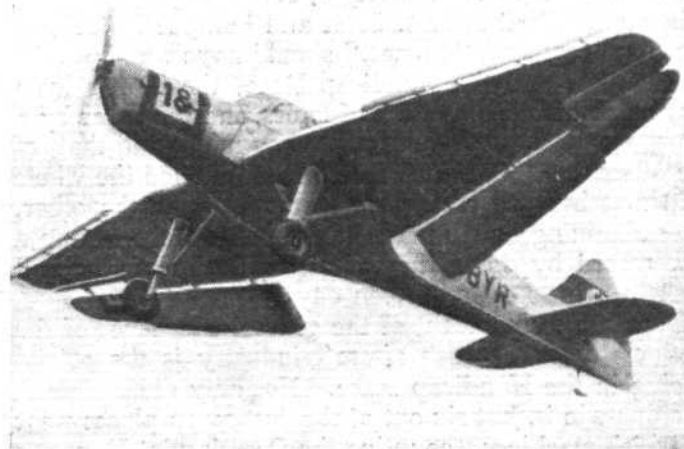
A Rundflug Echo

THAT our designers, manufacturers, and Air Ministry do not realise the improvement in design and performance of engines and aircraft brought about by the Challenge de Tourisme (or Rundflug, as it is more often called) was averred by Mr. W. D. Macpherson, the only British competitor this year, when speaking at the Royal Aero Club on November 12th. It certainly does seem surprising that no one availed himself of the opportunity afforded at Warsaw this year for inspection of the most interesting machines. Their chief characteristics were described in *Flight*, as well as the results of the numerous tests, but it is probable that personal inspection would have suggested new lines of thought to our designers.

Mr. Macpherson wisely agrees that the weight limit ought to be dropped if some suitable alternative can be found—a view which we have held since this event was first held in France in 1929. At one time it looked as if the machines built for the event were pure freaks, and the lessons learned from them not likely to be of use in the production of ordinary touring machines.

Lessons Learned

IN Mr. Macpherson's view, that time has now gone, though, unfortunately, the event has become a matter of Government support, and no private entry has, any longer, a chance. He feels, however, that it is now doing for flying what racing is doing for motoring. He is right as regards the effect the event has had on the development of speed-range, undercarriages upon which the aircraft can be dropped heavily, and engines of low weight per horsepower; but, while admitting that this development has been made on foreign aircraft, it should be remembered that much of the design work on those machines with regard to the various gadgets for giving a good speed-range and control at the stall has been done by designers in this country. Moreover, despite our lack of participation, we have available for the general public a light aeroplane with what is probably the largest speed-range of any standard machine now offered for sale anywhere in the world.



SUPER-FLAPPED: A Fieseler (Argus) in the take-off tests of the International Touring Competition at Warsaw, referred to above. Note the slots, the huge Fowler flaps extending along the wings, and the small allerons operating at the tips above the wing surface.

ON BELITTling AN ACHIEVEMENT

Sir Philip Sassoon, in this Special Article for "Flight," Criticises the Attitude of the Lay Press towards Britain's Melbourne Race Success: Is it Modesty—or just Perversity?

THERE is a curious and perverse habit too prevalent among English people of disparaging anything which our own countrymen have done and of lavishing extravagant praise upon the achievements of other nations. It may be modesty, but it is undoubtedly bad business. Only a very few of our neighbours who know us best—and sometimes write delightful books about us which only Englishmen read and every English reader thoroughly enjoys—really understand our idiosyncrasies. The thousand and one foreigners to whom we hope to sell our goods take what we say about ourselves at its face value. That does not help us to sell our goods.

Advertisement

There could scarcely be a better example of the sort of thing I mean than the articles and comments which have been appearing broadcast in the English Press (with certain honourable exceptions) about the Melbourne Air Race. We won that race with a British machine using British engines and flown by British pilots. Nevertheless, the aeroplane manufacturers and the pilots who, so far, have got the best advertisement out of the race in the English Press are the Douglas Company of America and Parmentier and Moll, of the Dutch K.L.M.

Yet, if the English Press wanted to say nice things about the British performance in the race, it would not be difficult for them to do so. It is surely a sufficiently remarkable achievement that Messrs. Scott and Campbell-Black, in their De Havilland "Comet," should have won both the Speed Race and the Handicap Race, the former by a margin of nineteen and a half hours, and the latter by a margin of nearly twelve hours. They might add that, of the other two "Comets" in the race, one led the whole field and beat all records to Karachi, while the other, after obtaining fourth place in the Speed Race, set up a new record by doing the round trip to Melbourne and back in a little over thirteen days.

Even more significant of the general excellence of the products of the British aircraft industry is the official placing in the Handicap Race. Not only did a British machine win it, but six out of the first seven places went to British machines—counting the Danish pilot Hansen's Desoutter Mark II, with its 120 h.p. "Gipsy III" engine, as British for the occasion.

It is no discredit, either, to the British aircraft industry that of the sixty-four original entrants for the race only twenty started, and that of those twenty no

fewer than fourteen were British machines and engines. With such a lot of good British material to choose from it does seem rather a pity that so much attention should have been concentrated upon the performance of the American machines, which, after all, did not win either of the events. The Boeing, indeed, was not placed in the Handicap Race at all, and even the Douglas, with its two Wright "Cyclone" engines, was on handicap less than three hours in front of Mr. Melrose's "Puss Moth" with its single 130 h.p. "Gipsy Major."

As usual, mere statistics do not tell the whole story. The air policy of the United States of America has permitted the payment to the American air transport companies of annual subsidies far in excess of anything that could even be considered in Great Britain. The result has been that for some time past air transport in America has been able to run at substantially greater speeds than Imperial Airways have yet attempted. The Douglas D.C.2 was not, therefore, specially constructed for this particular race. It is an ordinary production job which has not only gone through all the usual tests, but has had the very real additional advantage of practical experience in continuous flying.

A Triumph

Because Imperial Airways have built their fleet not only to give safe and comfortable service, but also to pay dividends to shareholders with the least possible reliance upon State subsidies, there

has been no demand for, and there did not exist in this country, a commercial aeroplane of the type of the Douglas D.C.2. Very early in the preparations for the race it became obvious that, if Britain was to have any real chance of winning the Speed Race, special machines would have to be designed to meet the conditions under which the race would be flown.

The real triumph of the race, therefore, is the unique achievement of the De Havilland Company in designing and constructing in record time a special machine and engine for a particular purpose, and in sending it out, practically straight from the stocks, to win the race both on speed and handicap. There was no time for trial and error, no opportunity to try out machine or engine under service conditions before the race. The race itself was to be the trial run. That the company succeeded is evidence of a degree of designing skill, of technical efficiency, and of reliability in craftsmanship of which the whole British aircraft industry is entitled to be proud.

Unless I am misinformed there was another machine which was specially built for the race, namely, the



The Right Hon. Sir Philip Sassoon, G.B.E., C.M.G., M.P., Under-Secretary of State for Air.

Bellanca monoplane entered by Hospitals Trust, Ltd. It did not meet with success.

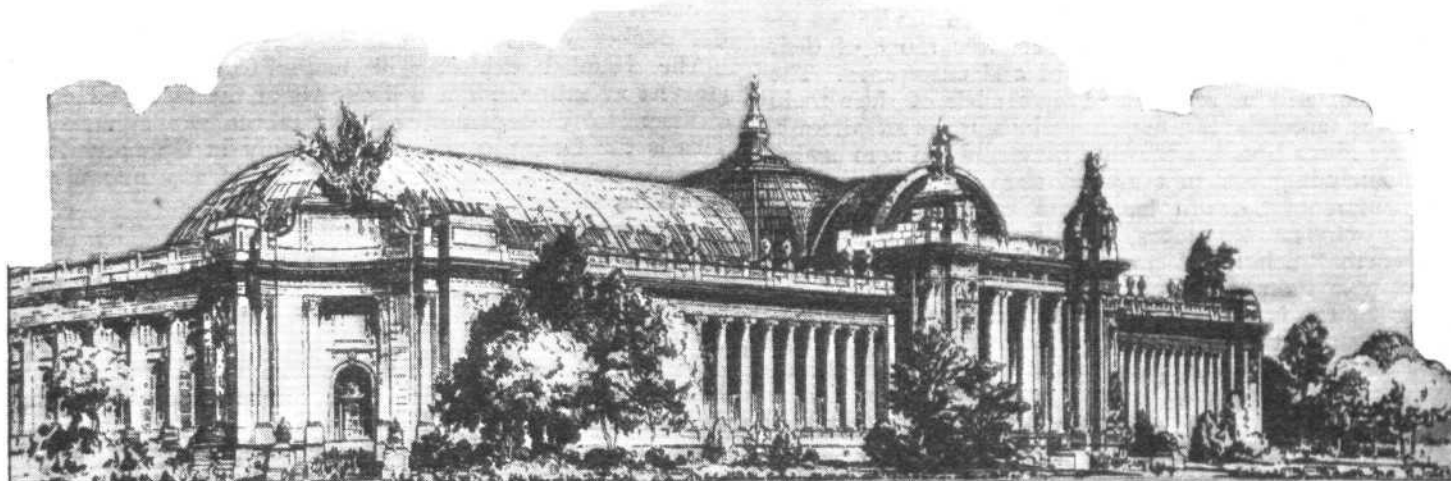
I have no wish to belittle the performance either of the Dutch and American pilots or of the American machines. It has, indeed, served a useful purpose. It has brought home to the British public the fact that there are air transport lines flying in the United States at an average speed of some 160 m.p.h. Even though the general average of all the American companies is only some 130 m.p.h., and even though this is achieved at a cost to the United States Post Office of between four and five million pounds a year, with petrol at something like sevenpence per gallon only, it is all to the good that the British public should be taught to look for higher speeds.

We are going to get them. Plans for a 7 $\frac{1}{2}$ -day service to Australia are already laid and have been in existence for some time. We already have transport machines capable of cruising at 145 m.p.h. The really important lessons of the Melbourne Race are that, given the demand for a particular type of machine, the British aircraft industry is thoroughly well capable of producing it, and that a machine built by a British company to do a particular job can be relied upon to do it.

The British aircraft industry still takes first rank in the quality of its products. The Press will be doing a service to the industry and to their country if they will make that fact clear in the eyes of the world. If they do that, the British industry will not let them down.

THE PARIS SHOW

*A Guide to the Exhibits : British Aircraft, Engine and Component Manufacturers
Better Represented than in the Past*



THE SETTING : To be opened to-morrow, November 16, by the President of the French Republic, the Paris Aero Show remains open until Sunday, December 2. It is being staged in the Grand Palais des Champs-Élysées, shown in the drawing above.

THE Fourteenth International Aero Exhibition, which is to be officially opened at the Grand Palais by M. Albert Lebrun, President of the French Republic, to-morrow morning, promises to be more truly international in character than most Paris Aero Shows of recent years. In addition to France, which will, as usual, be very well represented, the British section will include a greater number of firms than has usually been the case, and, of other nationalities, Germany, Italy, Czechoslovakia and Poland will be represented. Holland, for the first time for many years, will be an absentee, Mr. Fokker having decided not to exhibit.

Britain at the Show

Several complete aircraft will be exhibited by British constructors. Armstrong Whitworth will be represented by an A.W. "Scimitar" single-seater fighter, while the associated company, A. V. Roe and Co., will show a type 626 training biplane and an Autogiro C.30 P. Hawker Aircraft, Ltd., will be represented by a Special "Fury" Day and Night Fighter biplane, while Hawker structural methods will be well illustrated by a wing built entirely in stainless steel.

More fully represented than the aircraft firms will be the aero engine makers. For example, Armstrong-Siddeley Motors will have a very comprehensive range of engines, which will include the 700 h.p. "Tiger," the 600 h.p.

"Panther," the 340 h.p. "Serval," the 277 h.p. "Cheetah," the 215 h.p. "Lynx," and the 150 h.p. 7-cyl. "Genet Major."

The Bristol Aeroplane Company will have two novelties in the 600 h.p. "Perseus" and the 400 h.p. "Aquila," both nine-cylinder radial air-cooled sleeve-valve engines. The former is of 24.8 litres capacity and the latter of 15.6 litres. In addition, there will be on the Bristol stand a "Mercury VI," a "Pegasus III," and a "Pegasus IV." The last is the most highly supercharged.

Four distinct types will be exhibited by D. Napier and Son, i.e., a 160 h.p. "Javelin," a 305 h.p. "Rapier II," a 700 h.p. Halford-Napier "Dagger," and a Napier-Junkers "Culverin" of 720 h.p. The "Rapier" and "Dagger" are particularly interesting, in that they are of "H" formation, seen from the front. The "Rapier" has sixteen cylinders and the "Dagger" twenty-four. Both are air-cooled. The "Culverin" is the Junkers Jumo 4 built under licence in England by D. Napier and Son.

On the Rolls-Royce stand the most interesting engine will, perhaps, be the "Kestrel VI" of 600 h.p. normal rating. This engine is supercharged to 11,000 ft., and is cooled by a composite system employing both a steam condenser and a water radiator.

A fairly comprehensive range of British parts and accessories will be shown in the Salon.

The Dunlop Rubber Co., on the stand of their associated

French company, the Société Anonyme des Pneumatiques Dunlop, will have many examples of their tyres, wheels and brake equipment.

Capt. R. H. Stocken, on Stand No. 6 in the balcony, is representing four British companies: Aircraft Components, Ltd., Exactor Controls Co. Ltd., H. M. Hobson Ltd., and Reid and Sigrist Ltd. Aircraft Components are showing various forms of their "Dowty" undercarriage legs and retracting gear, while Exactor Controls will have a working model of the hydraulic control invented by Dr. Hele-Shaw and Mr. Beacham. H. M. Hobson will have on view the many aero engine carburettors which they make, as well as their other specialities, such as fuel pumps, cockpit controls and automatic mixture controls. Reid and Sigrist will show their Turn and Bank indicators, the Dove "Cloud Ring" and other instruments.

High-Duty Alloys will, on the stand of Fonderies Debard S.A., have a comprehensive display of forgings, stampings, and castings in their light alloy.

The stand of S. A. Bougies, K.L.G., will include a comprehensive exhibit of the products of four firms: Smiths Aircraft Instruments, Henry Hughes and Son, K.L.G. Sparking Plugs, Ltd., and the Plessey Company. Smiths Aircraft Instruments will be represented by their three-axes automatic pilot, wing-tip flares, Essex fire extinguisher, revolution indicators, etc. From Henry Hughes there will be such instruments as "Husyn" compasses, course-setting bomb sights, and navigation instruments. K.L.G. will have a complete range of their 14 and 18mm. plugs, both screened and unscreened. The Plessey Co. will be represented by models of their radio apparatus, suitable for use in various types of aircraft.

Lodge Plugs Ltd. are showing their range of aero engine plugs, including the new 14mm. size.

The Marconi Co. will have both transmitting and receiving wireless apparatus, installed in the Armstrong Whitworth "Scimitar" single-seater fighter.

The new Palmer one-piece streamline wheel will be shown for the first time; it is made from a single casting. In addition to this, The Palmer Tyre Ltd. exhibit a full range of their aircraft tyres, wheels and wheel brakes.

Standard Telephones and Cables will have three different models of their aircraft radio apparatus, a short-wave telephony transmitter, a transmitter and receiver suitable for internal air lines, and a more powerful outfit.

The Williamson Manufacturing Co. will not only have one of their latest "Eagle 4" aircraft cameras, but also their G.22 camera gun, designed for aerial combat practice.

The French Exhibits

As in previous years, French constructors will occupy the bulk of the aircraft stands. It looks as if Louis Breguet will have by far the most imposing show. This is a result of agreements made during the last year with the Wibault-Penhoët, Couzinet, Mauboussin, and Morane-Saulnier companies, whereby the Breguet company has become the central organisation of a very important group of aircraft constructors. Of particular interest will be the Breguet 41M.4, a twin-engined sesquiplane designed for fighting and bombing. The Morane-Saulnier firm will be represented by a type 275 single-seater fighter, a type 315 training machine and a type 341 touring machine. The Mauboussin "Corsaire" will also be shown on this stand. Breguet's reply to the Douglas D.C.2 will be the type 46T., a low-wing cantilever transport monoplane.

Marcel Bloch, one of the late-comers into the French aircraft industry, is to show a twin-engined bomber, type 200.

Small machines will form the Caudron exhibit this year. The types will include the 510 "Red Cross" machine, a 480, and a 520, both private owner's types.

The famous Farman Brothers will exhibit a type F.431 twin-engined machine, somewhat resembling the de Havilland "Dragon," a type F.393 touring machine, a type F.403, and a type F.404. The last three are touring aeroplanes.

Lioré et Olivier will show a LeO H.242, a four-engined

flying boat of the type recently put into service on the Marseilles-Algiers route of Air France. On this stand there will also be an Autogiro of the C.30 type.

Henry Potez will be represented at the Show by a type 540 multi-seater fighter, a type 56 transport machine, and a type 58 touring aeroplane. Models will be exhibited of the associated C.A.M.S. company's machines, such as the C.A.M.S., 110 long-range reconnaissance flying boat.

Dewoitine, whose French company has the title Société Aeronautique Française, intends to exhibit two types, the D.500 single-seater fighter (on the French Air Ministry's stand), and a D.511 single-seater fighter with "cut" wings, for which a speed of 250 m.p.h. is claimed.

S.E.C.M., whose machines are always known by the name Amiot followed by a number, are showing a type 143M multi-seater fighter. This machine is a large twin-engined cantilever monoplane, with a rotating gun turret in the nose of the fuselage.

All the French aero engine constructors will be represented by a very full range of power plants, water-cooled and air-cooled.

Germany at the Show

No fewer than seven German aircraft firms have taken space in the Grand Palais, through the Reichsverband der Deutschen Luftfahrt-Industrie. They are the Arado works, the B.F.W. company, the Fieseler works, the Focke-Wulf works, Ernst Heinkel, the Junkers works, and the Bücker works.

The Heinkel exhibit will undoubtedly attract the greatest attention, for it will consist of the famous He.70 commercial monoplane with retractile undercarriage. This is the fastest commercial not only in Germany but possibly in the world, being credited with a maximum speed of 355 km./h. (222 m.p.h.).

Two private owner's types will be shown by the Bavarian Aircraft Works, better known as the B.F.W., whose designer is Herr Willy Messerschmitt. The two types are the Me.35 and the Me.108, both low-wing cabin monoplanes.

Bücker's machine will be a "Jungmann," type Bü.131. This is a training biplane of fairly orthodox design, with 60 h.p. Hirth inverted engine.

The Focke-Wulf works are exhibiting a "Stieglitz" sports and school machine, powered by an Argus As-8 engine. At Le Bourget this firm will have for demonstration purposes a somewhat similar machine, but fitted with a Siemens Sh 14 A engine.

Junkers' exhibits will include one of the large commercial aeroplanes, and possibly a smaller type as well.

Other Nationalities

Few particulars concerning the exhibits of other nations are available. Italy, it is known, will show a Savoia-Marchetti machine. Czechoslovakia will be represented by two aircraft firms, Avia and Letov, in addition to the Walter firm, which will exhibit aero engines. The Russian Air Fleet also figures in the list of exhibitors.

NEXT WEEK!

FLIGHT

PARIS SHOW REPORT

Thursday, Nov. 22nd

NEXT Thursday's issue of "Flight" will include an extensive review of the exhibits at the Paris Aero Show, together with photographs and sketches by our own staff.

The regular features will be retained.

Definite orders for "Flight" should be placed with newsagents.
EVERY THURSDAY - - - SIXPENCE

THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS

The Paris Show Described

Next Thursday's issue of *Flight* will include an extensive and fully illustrated review of the exhibits at the Paris Aero Show, in addition to the regular features.

Kingsford-Smith's Next Hop

Sir Charles Kingsford-Smith, who recently flew from Australia to America, has planned a flight, in his Lockheed "Altair," from Los Angeles to Australia via New York and London.

Sir Hubert Wilkins

Sir Hubert Wilkins, of the Ellsworth Antarctic Expedition, arrived at Magallanes, Chile, last week to obtain spare parts for the expedition's aeroplane and a fresh supply of provisions, with which he is returning to the base camp at Deception Island.

Across America in 12 Hours

Flying a Douglas D.C.2 airliner, with a crew of two and three passengers, Capt. E. Rickenbacker flew from Los Angeles to Newark, New Jersey—a distance of 2,609 miles—in 12 hours 3 minutes 50 seconds, on Thursday last. This is a record for a coast-to-coast flight. Only one stop was made, at Kansas City, and the average speed was 219 m.p.h.

Aerial Photos Exhibition

The exhibition of aerial photographs, "Flying Over the Empire," which includes a collection of photographs showing some of the places on the routes of Imperial Airways, and a selection of long-distance infra-red photographs, is now on view in the museum of Tonbridge School. The exhibition will remain open until November 24.

U.S. Airship Scheme

According to our American contemporary, *Aero Digest*, the Respass Aeronautical Corp. of Cranston, R.I., has applied for a loan to finance the construction and operation of two airships, an airship factory, and a dock, for trans-Atlantic airship service. A Bill has been introduced in the House of Representatives authorising a loan of \$12,000,000 to the Respass company. The airships are to be 7,000,000 cu. ft. capacity, and of a new "suspension-bridge" design.

England-Australia Race

The prizes for the England-Australia Air Race were presented by the Duke of Gloucester at the Aerial Pageant at Laverton Aerodrome on Saturday. The prizes were: Speed Race—1st, C. W. A. Scott and T. Campbell Black (D.H. "Comet"), £10,000 and gold cup (value £650); 2nd, Roscoe Turner (Boeing 247-D), £1,500; 3rd, O. Cathcart Jones and K. Waller (D.H. "Comet"), £500. Handicap Race—1st, K. D. Parmentier and J. J. Moll (Douglas D.C.2), £2,000; 2nd, C. J. Melrose (D.H. "Puss Moth"), £1,000. Sq. Leader Stodart, who was placed fourth in the Handicap Race, has lodged a protest on the grounds of faulty checking times.

A Cape Record Attempt?

O. Cathcart Jones and Ken Waller have announced their intention of undertaking a record-breaking flight from England to the Cape in the D.H. "Comet."

Twenty-five Years Ago

From "Flight" of November 13, 1909.

"In view of the several proposals with regard to the use of airships and aeroplanes in connection with the exploration of Polar regions, it is interesting to note that in the course of his remarks at the R.A.C. recently anent his experiences in the Antarctic seas, Sir E. H. Shackleton, C.V.O., explained that it was almost impossible for any work to be done by flyers in the Far South regions. There was always a very strong wind blowing across the plateau, so that aeroplanes were out of the question, while balloons would be of no use . . . the valve, once opened, would not again close properly."

The Mollisons Home

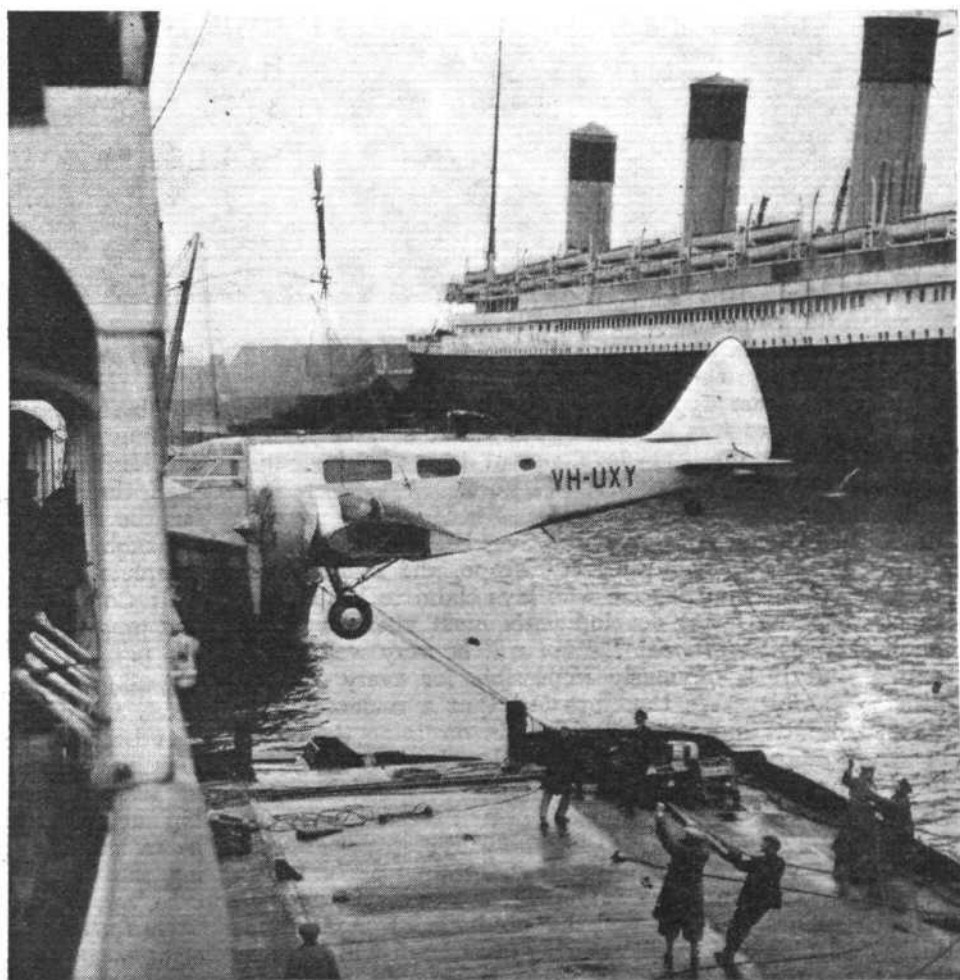
Mr. and Mrs. Mollison are back in England. Mrs. Mollison journeyed from Rome to Croydon in a K.L.M. airliner, and reached Croydon on Friday, and Mr. Mollison followed in their D.H. "Comet," arriving at Lympne on Sunday.

Miss Thompson in Australia

Miss Freda Thompson, who left Lympne on September 28 to fly to Australia, arrived at Darwin in her D.H. "Moth" ("Gipsy Major") on November 10. She is continuing her flight across Australia.

Police Work from the Air

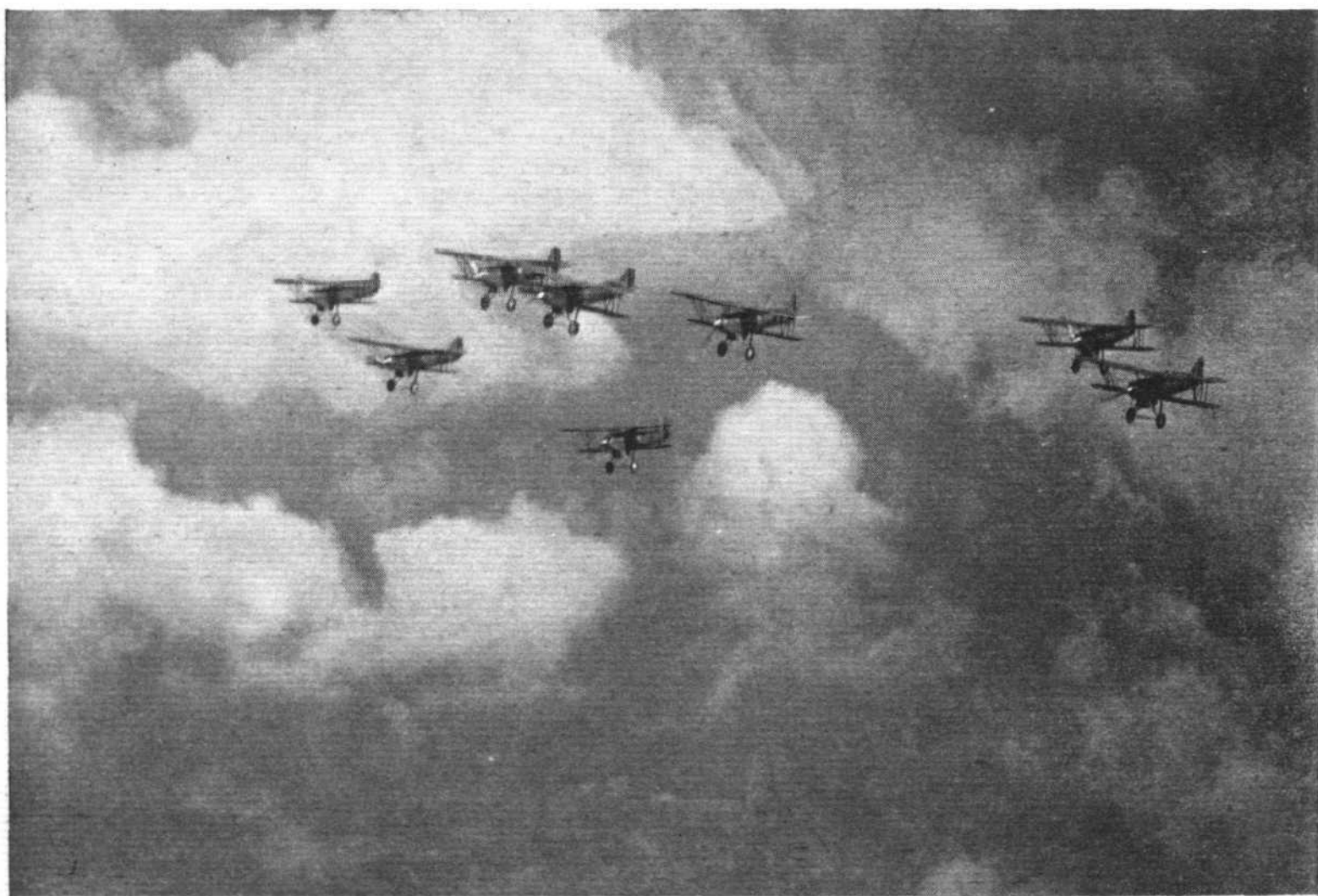
Capt. G. E. Lynch-Blosse, Chief Constable of Leicestershire, has submitted to the Standing Joint Committee of the Leicestershire County Council a report on the experiments in police work from the air carried out by the County Police. He suggests in this report that, in combating motor bandits, the registration mark of motor cars should be painted on the car roof; he shows that a wanted car, once spotted from the air, cannot get away.



FOR PACIFIC FLIGHT: The twin-engine Airspeed "Envoy" monoplane, in which Mr. C. T. P. Ulm and Mr. G. M. Littlejohn propose to fly from Canada across the Pacific to Australia, being shipped at Southampton for Montreal.

MODERN BRITISH AIRCRAFT

Civil and Military Types, the Products of Over Thirty



PROGRESS in aviation is still rapid. Although flying began more than thirty years ago there are no signs that we are approaching finality, or even that the rate of progress is slowing down. It may be taking different directions, but development is continuing, and aviation is more virile than ever before.

The Paris Aero Show, the fourteenth of which opens at the Grand Palais to-morrow, has ever been one to attract numerous visitors from all over Europe, and it has come to be accepted that anyone who lays claim to keeping in touch with the latest developments must visit the Paris Show. This year Great Britain will be very well represented, but it is obviously impossible for every British firm to exhibit. We therefore feel that a review of the British aircraft industry will assist in outlining the stage of development which British aviation has reached, and in giving an idea of the range of products which Great Britain has to offer.

In the following pages will be found descriptions, specifications, and/or photographs of more than sixty types of aircraft, and, on pages 1217-1223, nearly sixty types of British engines. These are the products of more than thirty designing and manufacturing firms, so it will be seen that the British aircraft industry is steadily assuming important proportions.

Analysing the material in the aircraft section, it is found that twenty-one aircraft firms produce at least sixty-two different types of aircraft. We say "at least," because

it has not been possible to include references to every type. For instance, a great number of new types have just been finished or are nearing completion, about which nothing may be said because they are being built for the Air Ministry. Furthermore, the industry includes more than the twenty-one aircraft firms, some of them being for the moment occupied on work other than aircraft, although they have not closed down their aircraft sections completely. In one other case, that of the Heston Aircraft Company, the firm has recently been reorganised, and production of the new types which are being designed has not yet begun.

Among the thirty-two military types produced by British firms, and dealt with in this issue, it is interesting to note that twenty-nine are biplanes and only three monoplanes. This preference of British designers for the biplane has been largely dictated by military considerations. The biplane, with its smaller span and lower weight, tends to be rather more manoeuvrable than the monoplane carrying the same military load. This is not invariably the case, but is a general rule to which there are exceptions.

On the civil side it is found that out of a total of twenty-eight machines, seven are biplanes and nineteen monoplanes, while one, the Autogiro, cannot be classed as either. This preponderance of monoplanes in civil aviation is rather surprising, and is of relatively recent occurrence. Not many years ago the biplane was preferred by British designers, even for civil aircraft. Two main reasons

AFT REVIEWED

is, Described and Illustrated



for this change in policy may be pointed out: the monoplane, and particularly the cantilever monoplane, with its rigid, unbraced wing, requires no trueing-up during service, as does a biplane. The second reason is connected with undercarriage drag. If a retractable undercarriage is used, the low-wing monoplane lends itself admirably to housing the wheels.

Metal construction has become universal for military aircraft, but wood has recently regained much of its popularity for civil aeroplanes, particularly for the smaller types.

When it comes to power plants, it is seen that among the military types twenty have air-cooled engines and twelve have water-cooled. Among the civil types there are no water-cooled engines at all. The radial and in-line engines are fairly evenly divided, with fifteen of the former and eleven of the latter.

ARMSTRONG WHITWORTH

Sir W. G. Armstrong Whitworth Aircraft, Ltd., is the full title of this firm, which is one of the group presided over by Sir John D. Siddeley, C.B.E. The other firms in the group are A. V. Roe & Co., Ltd., Armstrong-Siddeley Motors, Ltd., and Air Service Training, Ltd. The firm specialises in all-metal aircraft.

ONE of the first British firms to specialise in the all-metal construction of aircraft was Sir W. G. Armstrong Whitworth Aircraft, Ltd. The firm has produced a wide range of aircraft types, mostly military, and at the present time has under construction several new models for the British Air Ministry. These will, in many cases, incorporate quite new structural features. A number of civil types have also been produced, of which the best known is, perhaps, the *Atalanta* class of four-engined monoplane used by Imperial Airways.

Among recent military types it is possible to refer here to two only: the A.W. type 35 "Scimitar," and the A.W.19.

The "Scimitar" is a high-performance

single-seater fighter, which can be fitted with the Siddeley 640 h.p. "Panther" engine or the 725 h.p. "Tiger." The machine is a single-bay unequal span biplane, and two of the features which are essential in a machine of this type have been given very particular attention: field of vision and manoeuvrability.

In its standard form of construction, the "Scimitar" has a fuselage built of high-grade steel, and wings with main spars of high tensile steel strip. Alternatively, the fuselage can be supplied as a welded tubular structure, and the wings with spruce spars and ribs.

An undercarriage of the "split axle" type is fitted, the semi low-pressure tyres being partly enclosed in "spats." Dif-

ferentially controlled wheel brakes operated by pedals attached to the rudder bar are fitted.

The Siddeley engine is resiliently mounted on rubber pads. It is enclosed in a new type of engine cowling, which consists of an inner and an outer ring. The inner ring embraces the cylinder heads in such a way as to restrain the air to flow through the cylinder finning. The outer ring is of the large chord type, and gives a very low air drag.

The armament of the "Scimitar" consists of two 0.303 Vickers guns and four 20 lb. bombs under the starboard main plane.

Exceptional field of vision is also a feature of the A.W.10, which is a general-purpose military machine of the biplane

INDEX TO MAKES

The various makes of aircraft are dealt with in the succeeding pages as follows:—

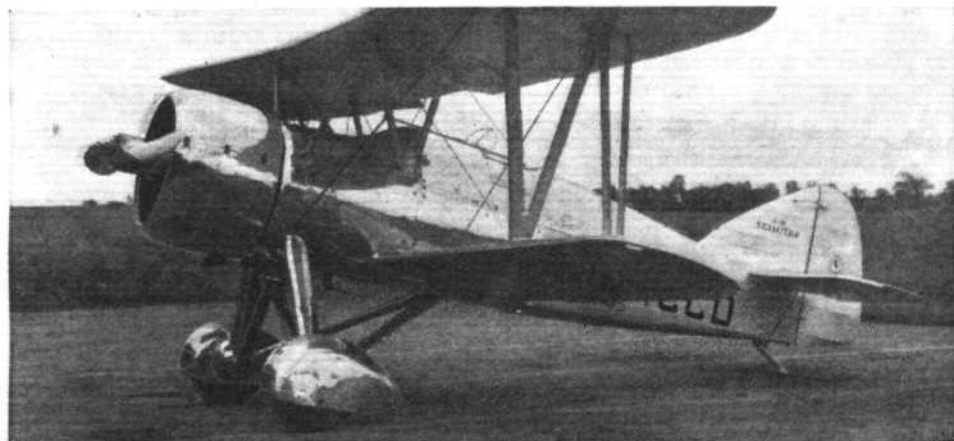
	Page
Airspeed	1200
Armstrong Whitworth..	1197
Avro	1201
Blackburn	1199
Boulton and Paul ..	1205
Bristol	1211
De Havilland	1198
Fairey	1203
General Aircraft ..	1212
Gloster	1213
Handley Page	1207
Hawk (see Phillips and Powis).	
Hawker	1213
Klemm	1214
Monospar (see General Aircraft).	
Percival	1209
Phillips and Powis ..	1208
Saro	1209
Short	1206
Spartan	1202
Supermarine (see Vickers)	
Vickers	1204
Westland	1210

A.W. "SCIMITAR"

640 h.p. Siddeley "Panther VII"

Type: Single-seater Fighter.

Length	25 ft. 0 in. (7.62 m)
Wing span: Upper ..	33 ft. 0 in. (10.06 m)
Lower	27 ft. 3 in. (8.30 m)
Wing area	261.4 sq. ft. (24.28 m ²)
Max. speed at	14,000 ft. (4 270 m)
	225 m.p.h. (362 km/h)
Time to	19,680 ft. (6 000 m), 11.5 mins.
Service ceiling	31,600 ft. (9 630 m)
Range	498 miles (800 km)
	With 76 galls. (345 litres) of fuel



type. The pilot is placed forward of, and on a level with, the leading edge of the top plane. The observer is located aft of the wings, in a well-screened cockpit. The engine of the A.W.19 is a 725 h.p. Siddeley "Tiger." The machine has been designed to carry the very large variety of equipment demanded of a general-purpose aircraft. It has a wing span of 42 ft. 2 in. (12.85 m.). The lower main plane is swept upwards at the roots to give ground clearance for the large items of armament carried.

Of commercial types produced by the Armstrong-Whitworth Company mention should be made of the "Atalanta" class, a four-engined high-wing monoplane fitted with four 340 h.p. Siddeley "Serval" engines. Several machines of this type are used by Imperial Airways.

CONSTANT additions to the de Havilland range during the last few years have placed this company in the position of having a range of aircraft covering almost the entire field of civil aviation, ranging from the open two-seater "Moth," through private owners' cabin machines to small commercial aircraft suitable for the private owner or for "feeder line" work. In addition the "Tiger Moth" with 120 h.p. "Gipsy III" or 130 h.p. "Gipsy Major" is available as a training machine and as a miniature single-seater fighter, while the "Comet," which recently won the England-Australia race, is at the other end of the scale as a racing machine or, in modified form, as a fast mail-carrier.

As the D.H. private owner's model par excellence we have the "Leopard Moth," a high-wing, strut-braced cabin monoplane with seating accommodation for pilot and two passengers. The pilot sits in front and the passengers side-by-side behind him.

First of the multi-seater de Havilland types came the "Dragon," a twin-engined cabin biplane mainly of wood construction, and with seating accommodation varying from six to ten passengers, according to the degree of comfort demanded and the flying range required. This machine is not particularly fast, but is very economical to operate.

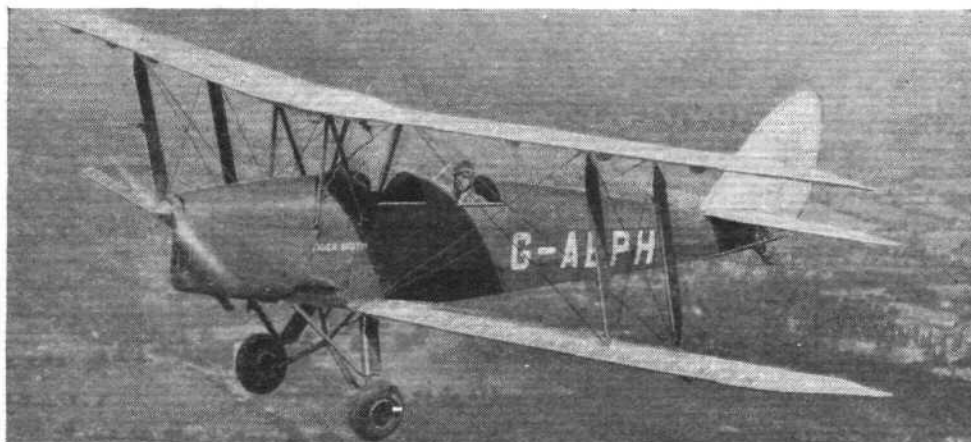
The "Dragon-Six" (designated D.H.89) is a twin-engined biplane with very tapering wings and accommodation for four to six passengers in great comfort, or for more if short journeys are contemplated. The machine is very fast, with a cruising speed of approximately 140 m.p.h. The engines are 200



A GENERAL PURPOSE TYPE: The Armstrong-Whitworth A.W.19. (725 h.p. Siddeley "Tiger").

THE DE HAVILLAND AIRCRAFT CO., LTD.

The company was founded shortly after the war by Capt. Geoffrey de Havilland, who is one of the pioneers of British aircraft designers. Capt. de Havilland began to design aeroplanes in 1909, and is still doing it; moreover, he still flies all his new types himself. The firm specialises in civil aircraft.



FOR ECONOMICAL TRAINING: The de Havilland "Tiger Moth" can be fitted with "Gipsy III" or "Gipsy Major" engine.

h.p. "Gipsy-Sixes," carefully faired into the lower wing and undercarriages.

Most ambitious of the de Havilland types developed from the original "Dragon" is the type 86, a four-engined biplane with the highly tapered wings of the "Dragon-Six," but with four 200 h.p. "Gipsy-Six" engines carried on the lower wing. Like the D.H.89, the 86 is a fast machine, its cruising speed being 145-150 m.p.h.

The gross weight is 10,000 lb., and the cabin can be arranged to have accommodation for from 8 to 16 seats, according to the degree of comfort and the flying range required. The machine is also available, at a gross weight of 8,800 lb., with four 130 h.p. "Gipsy Major" engines.

Machines of the D.H.86 type have been supplied in considerable numbers, among the purchasers being Imperial

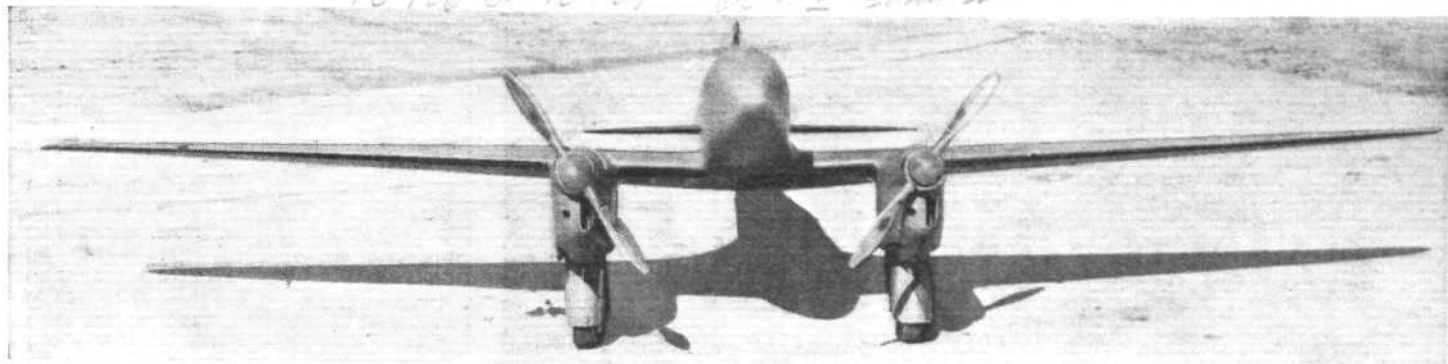


DE HAVILLAND "LEOPARD MOTH"

130 h.p. de Havilland "Gipsy Major"

Type: 3-seater Cabin Monoplane.

Length: ...	24 ft. 6 in. (7.47 m)
Wing span ...	37 ft. 6 in. (11.43 m)
Tare weight ...	1,375 lb. (624 kg)
Disposable load ...	850 lb. (385 kg)
Max. gross weight ...	2,225 lb. (1,010 kg)
Max. speed ...	140 m.p.h. (226 km/h)
Cruising speed ...	110 m.p.h. (192 km/h)
Stalling speed ...	50 m.p.h. (81 km/h)
Range ...	707 miles (1,138 km)
Climb ...	625 ft./min. (3,19 m/sec)
Service ceiling ...	14,500 ft. (4,420 m)



A WINNER: The de Havilland "Comet" on which C. W. A. Scott and T. Campbell Black secured first place in the England-Australia Race.

Airways, Ltd., who are believed to have them earmarked for the London-Paris service. Others are being supplied for the Australian end of the England-Australia air route. The use of four engines should ensure absolute immunity from forced landings, as the machine is well able to fly on three, or even on two of its engines.

It is worth placing on record the fact that the de Havilland Company has during recent years returned to wood construction. The first machine in which this was done was the "Fox Moth," a small three-four-seater biplane. The use of wood enabled this machine to carry 90 per cent. of its own weight as disposable load.

DE HAVILLAND "DRAGON"

Two 130 h.p. "Gipsy-Major"

Type: 6-10-seater Transport Biplane.

Length	34 ft. 6 in. (10.52 m)
Wing span	47 ft. 0 in. (14.33 m)
Tare weight	2,388 lb. (1 085 kg)
Disposable load	2,112 lb. (958 kg)
Gross weight	4,500 lb. (2 043 kg)
Max. speed	134 m.p.h. (216 km/h)
Cruising speed	114 m.p.h. (184 km/h)
Stalling speed	60 m.p.h. (96 km/h)
Fuel consumption	12 galls. (55 litres) per hour
Range	570 miles (917 km) With 60 galls. (272 litres)

DE HAVILLAND "DRAGON-SIX"

Two 200 h.p. "Gipsy-Six"

Type: Light Transport.

Length	34 ft. 6 in. (10.51 m)
Wing span	48 ft. 0 in. (14.63 m)
Wing area	340 sq. ft. (31.60 m ²)
Weight, bare	2,980 lb. (1 352 kg)
Disposable load	2,220 lb. (1 006 kg)
Gross weight	5,200 lb. (2 358 kg)
Max. speed	163 m.p.h. (262 km/h)
Cruising speed	138 m.p.h. (223 km/h)
Fuel consumption	18.25 galls. (83 litres) per hour
Climb	1,070 ft./min. (5.46 m/sec)
Ceiling	21,300 ft. (6 500 m)

DE HAVILLAND "86"

Four 200 h.p. de Havilland
"Gipsy-Six"

Type: 10-passenger Transport.

Length	44 ft. 0 in. (13.4 m)
Wing span	64 ft. 6 in. (19.66 m)
Wing area	600 sq. ft. (55.7 m ²)
Tare weight	5,550 lb. (2 520 kg)
Disposable load	4,450 lb. (2 017 kg)
Gross weight	10,000 lb. (4 536 kg)
Max. speed	170 m.p.h. (272 km/h)
Cruising speed	145 m.p.h. (232 km/h)
Fuel consumption	38 galls. (173 litres) per hour



BLACKBURN

The Blackburn Aeroplane & Motor Co., Ltd., to give it its full title, was founded by Mr. Robert Blackburn in 1909, and has been busy ever since. Mr. Blackburn was one of the earliest British pilots. Since the war the Blackburn company has devoted its attention mainly to military types, being best known for its torpedo-planes and flying boats.

ALTHOUGH the Blackburn firm is known chiefly for its military types, and particularly for its torpedoplanes, it has produced many others, both military and civil. For example, the little B.2 ("Cirrus-Hermes" engine) is a two-seater side-by-side training machine which has become very popular. At the other end of the scale there are the large Blackburn flying boats, of which the "Iris" is, perhaps, the most famous.

The latest version of the Blackburn "Iris" is known as the "Perth," and is a reconnaissance and coastal patrol boat of all-metal construction, fitted with three Rolls-Royce "Buzzard" engines of 925 h.p. each, and carrying a

crew of five. The armament of the "Perth" includes three machine guns, a load of 2,000 lb. of bombs, and a 35 mm. automatic gun, firing 1½ lb. shells, mounted in the extreme bows of the hull.

In external shape the hull of the "Perth" shows typical Blackburn lines, with a very "hollow" vee bottom, designed to reduce landing shocks. The hull is constructed throughout of "Alclad," with the exception of certain stainless steel attachment fittings.

A recent Blackburn production is the "Shark," a general-purpose biplane designed for coastal defence. The machine can be converted into a sea-

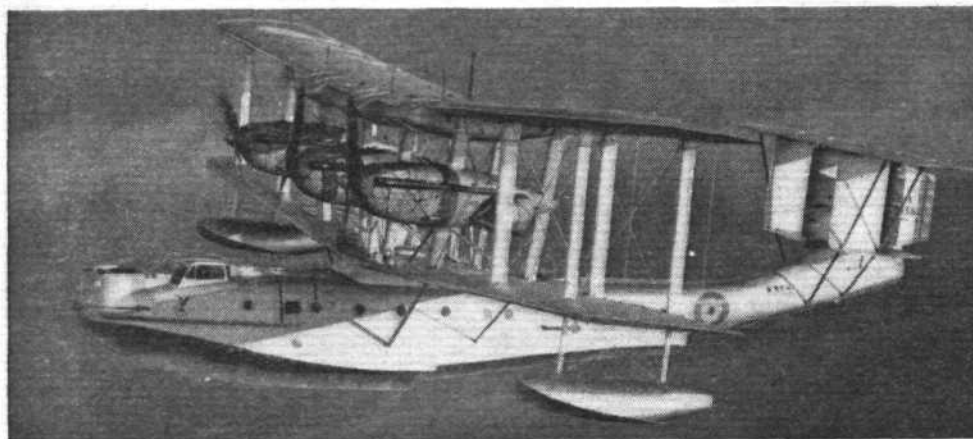
plane by fitting floats, and can also be used as a ship-plane on board aircraft carriers. As a torpedo-bomber the machine carries a bomb load weighing 1,500 lb., while as a fleet spotter it carries enough fuel for a range of 625

BLACKBURN "B.2" TRAINER

120 h.p. Cirrus-Hermes IV A

Type: 2-seater Side-by-side School Machine.

Tare weight	1,175 lb. (533.5 kg)
Normal load	575 lb. (261 kg)
Normal gross weight	1,750 lb. (794 kg)
Max. aerobatic weight	1,770 lb. (803.6 kg)
Max. permissible gross weight	1,850 lb. (839 kg)
Max. speed	112 m.p.h. (180 km/h)
Cruising speed	95 m.p.h. (152 km/h)
Landing speed	46 m.p.h. (75 km/h)

**BLACKBURN "PERTH"***Three 825 h.p. Rolls-Royce "Buzzard"*

Type: Reconnaissance and Coastal Patrol Flying Boat.

Length	...	70 ft. 0 in. (21.35 m)
Wing span	...	97 ft. 0 in. (29.5 m)
Tare weight	...	20,927 lb. (9 500 kg)
Disposable load	...	11,573 lb. (5 255 kg)
Gross weight	...	32,500 lb. (14 755 kg)
Max. gross weight	...	38,000 lb. (17 252 kg)
Max. speed	...	115 knots (212 km/h)
Climb	...	800 ft./min. (244 m/min)
Landing speed	...	55 knots (100 km/h)
Normal range	...	780 sea miles (1 445 km)
Max. range	...	1,300 sea miles (2 407 km)

BLACKBURN "SHARK"*725 h.p. Siddeley "Tiger"*

Type: Fleet Spotter Reconnaissance.

Length	...	35 ft. 3 in. (10.75 m)
Wing span	...	46 ft. 0 in. (14.03 m)
Tare weight	...	4,039 lb. (1 830 kg)
Disposable load	...	3,001 lb. (1 360 kg)
Gross weight	...	7,040 lb. (3 190 kg)
Max. speed	...	157 m.p.h. (253 km/h)
	At 6,000 ft. (1 830 m)	
Rate of climb	...	1,230 ft./min. (375 m/min)
Service ceiling	...	20,400 ft. (6 220 m)



miles. A feature of the construction of the "Shark" is that no flotation bags are carried. The fuselage itself is a *monocoque* structure, divided into watertight compartments, so that even if the

cockpits become flooded the closed compartments have sufficient buoyancy to keep the machine afloat. The power plant is an Armstrong Siddeley "Tiger" of 725 h.p.

Recently the Blackburn Company has made arrangements with Mr. F. Duncanson to build civil machines incorporating the Duncanson tubular single-spar wing construction.

AIRSPEED LIMITED

One of the younger British firms, founded by Mr. N. S. Norway and Mr. A. H. Tiltman. Recently the company joined forces with the well-known shipbuilding company, Swan, Hunter & Wigham Richardson, Ltd.

THE first machine to be designed and built by Messrs. Norway and Tiltman was known as the "Ferry." It was a three-engined biplane of somewhat unorthodox layout, designed specifically for economical "joy-riding" at meetings where considerable numbers of passengers had to be taken up in a very short time. The success achieved with that machine led to the production of others, of which the first was the "Courier," a low-wing cantilever monoplane, mainly of wood construction. A notable feature of the "Courier" is that it was the first modern British aeroplane to be equipped with a retractable undercarriage.

Fundamentally, the Airspeed

"Courier" is a long-range passenger carrying aeroplane, providing accommodation for pilot and five passengers, with a generous allowance of luggage. The chairs are arranged in pairs, side by side, and, if desired, dual control can be provided for the passenger sitting next to the pilot. The clean aerodynamic design has enabled a cruising range of 700 miles at 143 m.p.h. to be attained with an engine of relatively low power (a 240 h.p. Siddeley "Lynx").

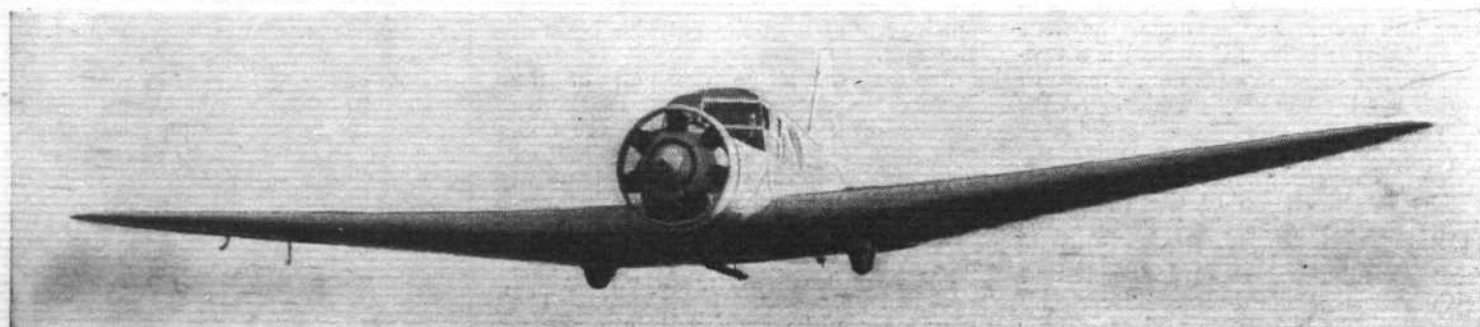
Hydraulic operation of the undercarriage gear is employed, and it is, perhaps, worth mentioning here that, as far as we know, there is no case on record of this undercarriage having failed in any

AIRSPEED "COURIER"*240 h.p. Siddeley "Lynx" IV C*

Type: 5-passenger Cabin Monoplane.

Length	...	28 ft. 6 in. (8.69 m)
Wing span	...	47 ft. 0 in. (14.33 m)
Wing area	...	250 sq. ft. (23.22 m ²)
Tare weight	...	2,210 lb. (1 002 kg)
Fuel and oil	...	490 lb. (223 kg)
Six people	...	960 lb. (434 kg)
Luggage, etc.	...	240 lb. (109 kg)
Gross weight	...	3,900 lb. (1 768 kg)
Max. speed	...	162 m.p.h. (261 km/h)
Cruising speed	...	143 m.p.h. (230 km/h)
Landing speed	...	55 m.p.h. (88 km/h)
Climb	...	820 ft./min. (4.18 m/sec)
Range	...	700 miles (1 126 km)

way. When Sir Alan Cobham landed at Malta recently with the wheels in the "up" position he did so deliberately, in order to obtain the longest and flattest



AIRSPPEED "ENVOY"*Two 185 h.p. Wolseley A.R.9, Mark I*

Type: 6-8-passenger Transport.

Length	34 ft. 6 in. (10.5 m)
Wing span	52 ft. 4 in. (15.9 m)
Wing area	339 sq. ft. (31.5 m ²)
Tare weight	3,442 lb. (1,561 kg)
Crew	170 lb. (77 kg)
Disposable load	1,688 lb. (766 kg)
Gross weight	5,300 lb. (2,404 kg)
Max. speed	170 m.p.h. (274 km/h)
Cruising speed	150 m.p.h. (242 km/h)
Landing speed	61 m.p.h. (101 km/h)
Climb	880 ft./min. (4.80 m/sec)

glide possible so as to reach the aerodrome.

"Envoy" is the name given to the second Airspeed model to be produced. This machine resembles the "Courier" in its general construction, having the same highly tapered pointed-tip wing plan form. It is, however, a twin-engined machine, the power units being



two Wolseley A.R.9 engines of 185 h.p. each.

Ability to fly on one engine was one of the features kept in mind by the designers when producing the "Envoy." Although the power expenditure is very modest, the retractable undercarriage and the generally clean aerodynamic design makes this possible.

The cabin can be arranged for six or eight passengers, according to requirements. When eight seats are installed no lavatory is provided. In spite of the fact that the power expenditure is but 46 h.p. per passenger (when eight are carried), the cruising speed is 150 m.p.h.

Another model, the "Viceroy," has two 290 h.p. "Cheetah" engines.

A. V. ROE & CO., LTD.

One of the earliest British aircraft firms, founded by Sir Alliott Verdon Roe, who is, however, no longer connected with the firm which bears his name, the company now being one of the Siddeley group. For many years specialists in training aircraft, the firm has recently added a number of other models.

THE name "Avro" has been associated with training aeroplanes from the early days of flying. More recently the firm has turned its attention to other types, and the range of aircraft now offered is a very wide one. However they may differ in details, one feature which all modern Avro machines

have in common is the welded steel tube fuselage. The biplane types have mostly strip steel spars, but the monoplanes have all-wood wings, with plywood covering.

"Tutor" is the name of the Avro machine which is the standard training aeroplane of the British Royal Air Force.

The engine fitted is a 215 h.p. Siddeley "Lynx." The Avro 626 is generally similar to the "Tutor," but is equipped for training in gunnery, bombing, wireless, etc. The standard power plant is the 277 h.p. Siddeley "Cheetah" engine.

For training at low cost, there is the Avro "Cadet," a small two-seater biplane fitted with the 135 h.p. Siddeley "Genet Major" engine.

A modern Avro type for the private owner is the "Commodore," a cabin biplane four-seater, with the Siddeley "Lynx" engine. The design is planned on the lines of a comfortable motor car.

AVRO "TUTOR"*215 h.p. Siddeley "Lynx"*

Type: Training Aeroplane.

Length	26 ft. 6 in. (8.08 m)
Wing span	34 ft. 0 in. (10.36 m)
Wing area	300 sq. ft. (27.9 m ²)
Tare weight	1,800 lb. (816 kg)
Disposable load	658 lb. (299 kg)
Gross weight	2,458 lb. (1,115 kg)
Max. speed	122 m.p.h. (196 km/h)
Cruising speed	105 m.p.h. (169 km/h)
Landing speed	45 m.p.h. (72 km/h)
Service ceiling	14,200 ft. (4,340 m)
Climb	1,000 ft./min. (5.08 m/sec)
Range	290 miles (465 km)

**AVRO "642"***Two 460 h.p. Siddeley "Jaguar"*

Type: 16-passenger Transport.

Length	54 ft. 6 in. (16.61 m)
Wing span	71 ft. 3 in. (21.72 m)
Wing area	728 sq. ft. (67.7 m ²)
Tare weight	7,400 lb. (3,357 kg)
Disposable load	4,400 lb. (1,996 kg)
Gross weight	11,800 lb. (5,353 kg)
Max. speed	160 m.p.h. (257 km/h)
Cruising speed	135 m.p.h. (217 km/h)
Landing speed	64 m.p.h. (103 km/h)
Climb	970 ft./min. (4.93 m/sec)
Service ceiling	15,500 ft. (4,724 m)
Range up to	600 miles (966 km)

According to number of seats.

**AVRO AUTOGIRO "C.30"***150 h.p. Siddeley "Genet Major"*

Type:	Open 2-seater.
Length	19 ft. 8 in. (6.0 m)
Rotor diameter	37 ft. 0 in. (11.3 m)
Tare weight	1,265 lb. (574 kg)
Disposable load	635 lb. (288 kg)
Gross weight	1,900 lb. (862 kg)
Max. speed	110 m.p.h. (177 km/h)
Cruising speed	95 m.p.h. (153 km/h)
Min. speed	15 m.p.h. (24 km/h)
Landing speed	Nil.
Climb	900 ft./min. (4.57 m/sec)
Service ceiling	17,000 ft. (5,180 m)
Range	285 miles (459 km)

AVRO "652"*Two 277 h.p. Siddeley "Cheetah V"*

Type:	8-passenger Transport.
Length	42 ft. 3 in. (12.90 m)
Wing span	56 ft. 6 in. (17.22 m)
Wing area	410 sq. ft. (38.1 m ²)
Tare weight	4,395 lb. (1,993 kg)
Disposable load	2,405 lb. (1,091 kg)
Gross weight	6,800 lb. (3,085 kg)
Max. speed	175 m.p.h. (282 km/h)
Cruising speed	150 m.p.h. (242 km/h)
Landing speed	60 m.p.h. (96 km/h)
Climb	1,000 ft./min. (5.08 m/sec)
Service ceiling	18,000 ft. (5,500 m)

The performance figures are estimated.

AVRO "626"*277 h.p. Siddeley "Cheetah"*

Type:	Training and Transformation.
Length	34 ft. 0 in. (8.08 m)
Wing span	36 ft. 9 in. (10.36 m)
Wing area	300 sq. ft. (27.9 m ²)
Tare weight	2,010 lb. (912 kg)
Disposable load	658 lb. (298 kg)
Gross weight	2,668 lb. (1,210 kg)
Max. speed	130 m.p.h. (209 km/h)
Cruising speed	108 m.p.h. (174 km/h)
Landing speed	50 m.p.h. (84 km/h)
Service ceiling	16,800 ft. (5,090 m)
Climb	1,000 ft./min. (5.08 m/sec)
Range	251 miles (404 km)

AVRO "COMMODORE"*215 h.p. Siddeley "Lynx"*

Type:	4-seater Cabin Biplane.
Length	27 ft. 3 in. (8.31 m)
Wing span	37 ft. 4 in. (11.37 m)
Wing area	307 sq. ft. (28.5 m ²)
Tare weight	2,325 lb. (1,055 kg)
Disposable load	1,175 lb. (533 kg)
Gross weight	3,500 lb. (1,588 kg)
Max. speed	125 m.p.h. (201 km/h)
Cruising speed	110 m.p.h. (177 km/h)
Landing speed	55 m.p.h. (88 km/h)
Climb	650 ft./min. (3.30 m/sec)
Service ceiling	11,500 ft. (3,530 m)
Range	468 miles (753 km)

Designed for very economical commercial operation is the Avro 642, a high-wing cantilever monoplane, fitted with either two 460 h.p. Siddeley "Jaguar" engines or four Siddeley "Lynx" engines, in both cases placed on the leading edge of the wing. Accommodation can be provided for up to 16 passengers if the range required is not long. In spite of the low power, the 642 cruises at 135 m.p.h. with the "Jaguars" and at 127 m.p.h. with the four "Lynx."

Two very recent types are the Avro 652 and the Avro 660. Two of the former are now nearing completion for Imperial Airways. The 652 differs from the 642 in that it is a low-wing monoplane, and is fitted with a retractable undercarriage. The 660 is a similar machine, but smaller, and is fitted with two Siddeley "Genet Major" engines instead of the two "Cheetahs" of the 652. It also differs in that the undercarriage does not retract.

Finally, the Avro Company now

**COMFORTABLE TRAVEL:** The Avro "Commodore" ("Lynx" engine).

manufactures the direct-control Autogiro, type C.30P. In this there is no fixed wing and no tail control surfaces

nor ailerons, all manoeuvres being carried out by tilting the head of the rotor. The machine lands without any run.

SPARTAN AIRCRAFT LTD.

One of the younger British aircraft firms, the Spartan company has a strong link with aviation history in that Sir Alliott Verdon-Roe and Mr. John Lord are on the board of directors.

DESIGNED specially for "feeder line" work, the Spartan "Cruiser" is of "mixed" construction, the fuselage being built rather like the hull of a flying boat, which gives the machine the ability to spend, if necessary, long periods in the open, a feature which may be valuable when operating a long way from a base. The machine is a three-engined low-wing cantilever monoplane, and the reserve power is such that height can be main-

tained with any one of the three engines stopped. Thus forced landings should be very rare occurrences.

The fuselage is mainly of "Alclad" construction, with fore-and-aft corrugations externally to give stiffness to the covering. Panel beating has been avoided, so that repairs in the field can be made with a good degree of ease. The wings are of wood construction, the covering being plywood.

Engines of 120-130 h.p. are suitable,

the usual models being the "Cirrus-Hermes IV" and the "Gipsy-Major." The two petrol tanks are housed in the wing, each having a capacity of 60 gallons (273 litres). If the machine is carrying more than six people, the tanks will not normally be filled quite full, but will contain sufficient fuel for four hours at a cruising speed of about 116 m.p.h. With full tanks and three passengers, the range can be extended to 620 miles.

Triplex windows of large area give good lighting in the cabin, which may have seats for up to ten passengers, although the range is then fairly short. A more normal cabin layout is for five to six passengers, whose seats are very comfortable, with plenty of leg room. If desired, the pilot's compartment can be partitioned off from the main cabin.

SPARTAN "CRUISER"*Three 130 h.p. "Gipsy-Major"*

Type: 5-passenger Light Transport.

Length	39 ft. 2 in. (11.95 m)
Wing span	54 ft. 0 in. (16.45 m)
Wing area	436 sq. ft. (40.5 m ²)
Tare weight	3,650 lb. (1,655 kg)
Disposable load	2,150 lb. (975 kg)
Gross weight	5,800 lb. (2,630 kg)
Max. speed	133 m.p.h. (214 km/h)
Cruising speed	118 m.p.h. (190 km/h)
Landing speed	59 m.p.h. (95 km/h)
Climb	630 ft./min. (3.21 m/sec)
Range	310 miles (500 km)

**THE FAIREY AVIATION CO., LTD.**

For many years one of the largest suppliers of general-purpose aircraft in the world, the Fairey Company has produced a wide range of types. The Fairey "Fox" some years ago set a new fashion in high-performance two-seaters.

OF the large number of types produced by the Fairey Company it is possible to refer here to a few only. All have structural features in common, such as welded steel-tube fuselages, using a special system developed by the company, and strip steel wing spars.

Two Fairey types which differ in seating accommodation only are the "Gordon" and the "Seal." The former is a general-purpose aeroplane, with cockpits arranged for two, while the "Seal," being a Fleet Air Arm type, carries in

addition a seat for the wireless operator. Both machines are fitted as standard with the 535 h.p. Siddeley "Panther II A." They have been widely adopted for the R.A.F., as well as by foreign countries such as Argentina, Brazil, Chile, Greece and Peru.

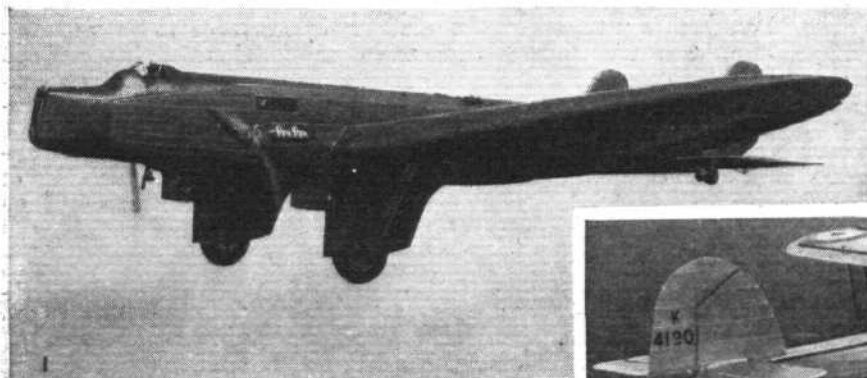
A Fairey type which set a new fashion was the "Fox." Recent models of it have been built in large numbers in Belgium. The machine is a high-performance two-seater day bomber and reconnaissance, normally fitted with the

525 h.p. Rolls-Royce "Kestrel." An alternative power plant is the 860 h.p. Hispano 12 Ybrs. An advanced training model is available, fitted with the 340 h.p. Siddeley "Serval." When fitted with the Hispano engine the "Fox" has a performance comparable with that of a single-seater fighter.

Somewhat similar in general lines is the Fairey "Firefly" single-seater fighter, also adopted by the Belgian Air Force. Like the "Fox," it has a "Kestrel" engine.

The Fairey "T.S.R." (Torpedo Spotter Reconnaissance) type (690 h.p. Bristol "Pegasus III") is at present undergoing Air Ministry trials, and no particulars may, therefore, be published.

Of particular interest because it represents a complete break-away from



FOUR FAIREY TYPES: 1, The "Hendon" Night Bomber (two Rolls-Royce "Kestrels"); 2, The T.S.R. (Bristol "Pegasus"); 3, The "Firefly," single-seater fighter (Rolls-Royce "Kestrel"), and 4, The "Seal," Fleet Air Arm three-seater (Siddeley "Panther").



TWO VERSIONS OF THE FAIREY "FOX": On the left, the Hispano-engined model, which has a startling performance, and on the right, the Advanced Training Type, fitted with Siddeley "Serval" engine.

orthodox Fairey practice is the large long-range night bomber, the "Hendon." Fitted with two Rolls-Royce "Kestrel" engines of 525 h.p. each, this machine is a low-wing cantilever monoplane of exceptionally clean design, with the engine nacelles faired into the thick wing, and the wheels of the

undercarriage enclosed in streamline "trousers," and each leg is braced laterally by a single strut to the front spar.

Gun positions are provided in the extreme nose and stern of the fuselage, and another about midway, above and behind the trailing edge of the wings. The pilot, seated behind and above the

forward gunner, has an excellent view in all essential directions. The bombs are carried inside the centre-section of the wing, where they add no extra air drag. The gross weight of the "Hendon" is approximately nine tons.

It is regretted that no performance figures may be published.

VICKERS-SUPERMARINE

The amalgamation, some years ago, of Vickers (Aviation) Limited and the Supermarine Aviation Works has resulted in a very strong combination. Generally, although not invariably, the Vickers Company produces the landplanes and Supermarine the flying boats and seaplanes.

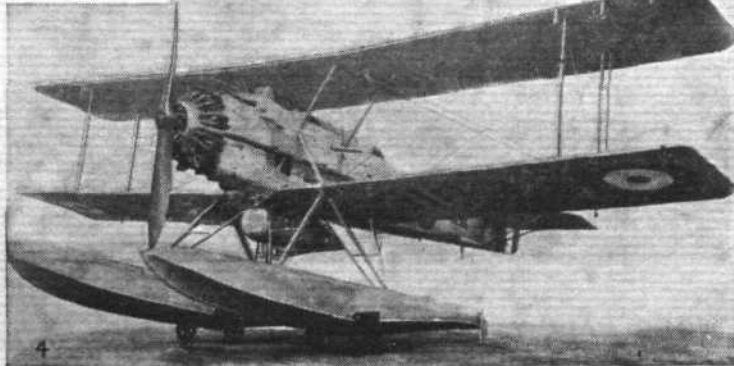
STRUCTURAL efficiency of a very high order has for many years characterised Vickers aeroplanes. A good example of this is the "Vildebeest" Torpedo Bomber, which carries as disposable load slightly more than its own weight. This machine, which is fitted with the 580 h.p. Bristol "Pegasus" engine, has been adopted by the R.A.F. As a seaplane, the machine has been adopted by the Spanish Naval Air Service. In a slightly modified form the "Vildebeest" becomes a general-purpose type, and is then known as the "Vincent."

"Vellox" is the name of a Vickers twin-engined type suitable for civil and military work. With two "Pegasus" engines of 580 h.p. each the machine has a gross weight of 13,500 lb., a disposable load of 5,300 lb., and a maximum speed of 160 m.p.h. The cabin floor has been designed to carry a weight of 6,000 lb. A float undercarriage can be substituted.

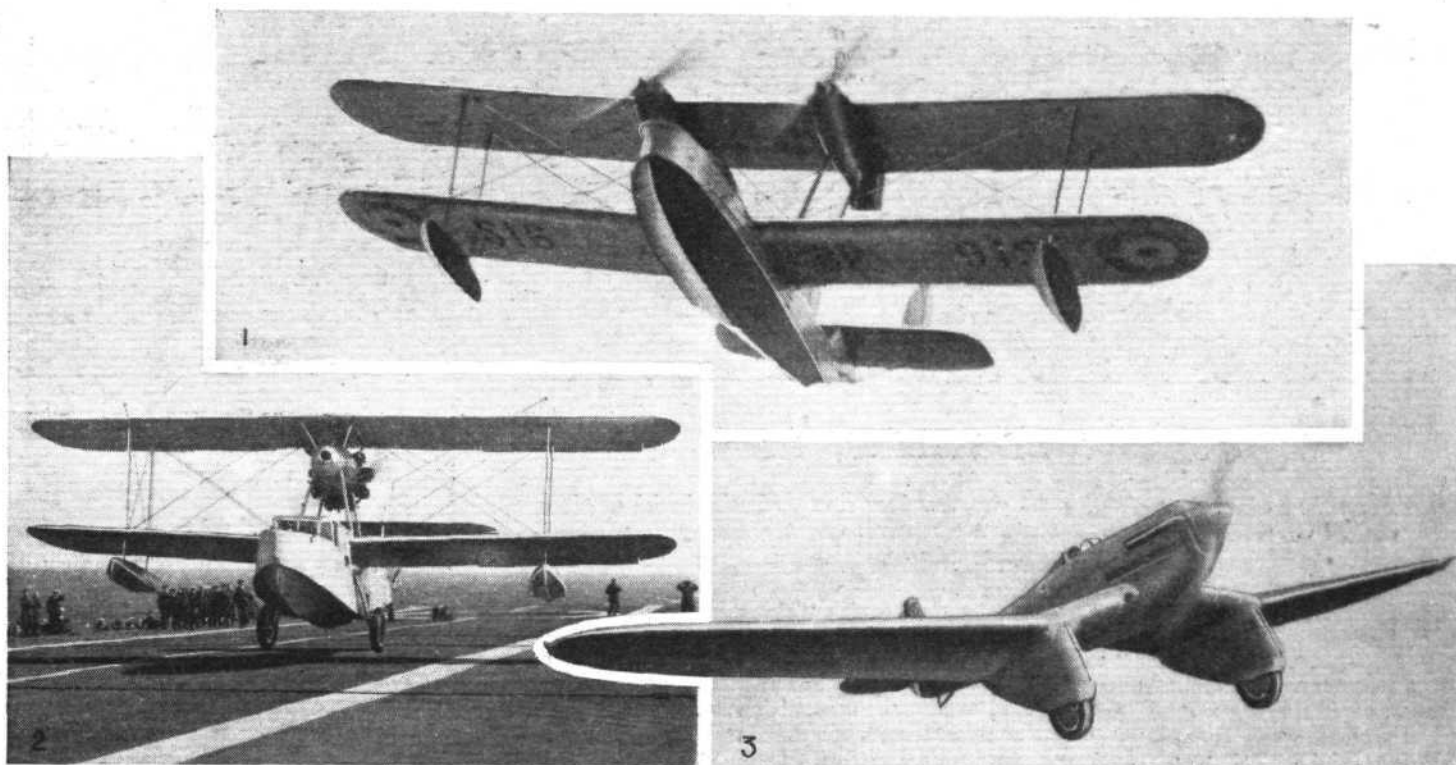
For many years the Vickers "Vic-

toria" has been doing excellent work as a troop-carrier. A recent development of this machine is the "Valentia," fitted with two 600 h.p. "Pegasus" engines. Its gross weight is 19,500 lb., and it carries 22 troops, in addition to a crew of two.

The name "Supermarine" has for very many years been associated with flying boats. In fact, the company was originally founded, before the war, for the express purpose of building flying boats. The latest type to go into production is the "Scapa," a twin-engined all-metal flying boat intended for reconnaissance, bombing and torpedo transport. The two 525 h.p. Rolls-Royce "Kestrel" engines are placed under the top plane, where they are well clear of spray while the machine is running on the sea. The machine is able to fly with



SOME VICKERS TYPES: 1, The "Valentia" (two "Pegasus") Troop-carrier; 2, The "Vellox" (two "Pegasus") heavy load carrier; 3, The "Vincent" ("Pegasus") general-purpose machine; 4, The "Vildebeest" ("Pegasus") Torpedo Bomber.



LARGE AND SMALL: Some Vickers-Supermarine machines: 1, The "Scapa" flying boat (two Rolls-Royce "Kestrels"); 2, The "Seagull" Mark V (Bristol "Pegasus" pusher) amphibian flying boat; 3, The single-seater day and night fighter (Rolls-Royce "Goshawk").

one of the engines stopped, and the rudders are powerful enough to enable the machine to be turned against the running engine. An easily detachable chassis is provided for launching and beaching.

Produced in 1933, the "Seagull" Mark V amphibian flying boat has been adopted by the Royal Australian Air

Force, and large numbers have been ordered. The machine is a "pusher" (600 h.p. "Pegasus" engine), and has an all-metal flat-sided hull. Successful catapult launch trials have been carried out, so that the "Seagull" can start from the sea, from land, or by catapult from a vessel. This ability naturally increases its usefulness very greatly.

Entering the field of landplane construction, the Supermarine works produced a short time ago a single-seater day-and-night fighter, fitted with the 600 h.p. Rolls-Royce "Goshawk" steam-cooled engine. The machine is a low-wing cantilever all-metal monoplane of very clean design, as the photograph shows.

BOULTON AND PAUL, LTD.

This was one of the first British firms to go over to all-metal construction, and some very ingenious structural methods have been evolved by this company.

THE Boulton and Paul "Overstrand," now in production for the British Royal Air Force, is the logical development of the "Sidestrand" twin-engined day bomber which has been in service for some years. The new machine is suitable for either day or night bombing. It is an equal-span biplane of all-metal construction fitted with two Bristol moderately supercharged "Pegasus" engines.

In general aerodynamic and structural design, the "Overstrand" resembles closely the "Sidestrand," but a number of features have been incorporated which add materially to the all-round utility of the machine. Perhaps the most important innovation, from a military point of view, is the use of a completely enclosed, mechanically operated gun turret in the nose of the fuselage. This gun turret is so arranged that it can be rotated around a vertical axis very rapidly by the gunner, and a narrow slot in the turret enables the machine gun to be moved up or down for firing in any direction from vertically upwards to vertically downwards. The difficulty of working the gun at the very high speed at which the machine flies is thus obviated.

An "automatic pilot" is carried in the "Overstrand," and maintains equilibrium and a steady flying speed with greater accuracy than is possible by direct manual control.

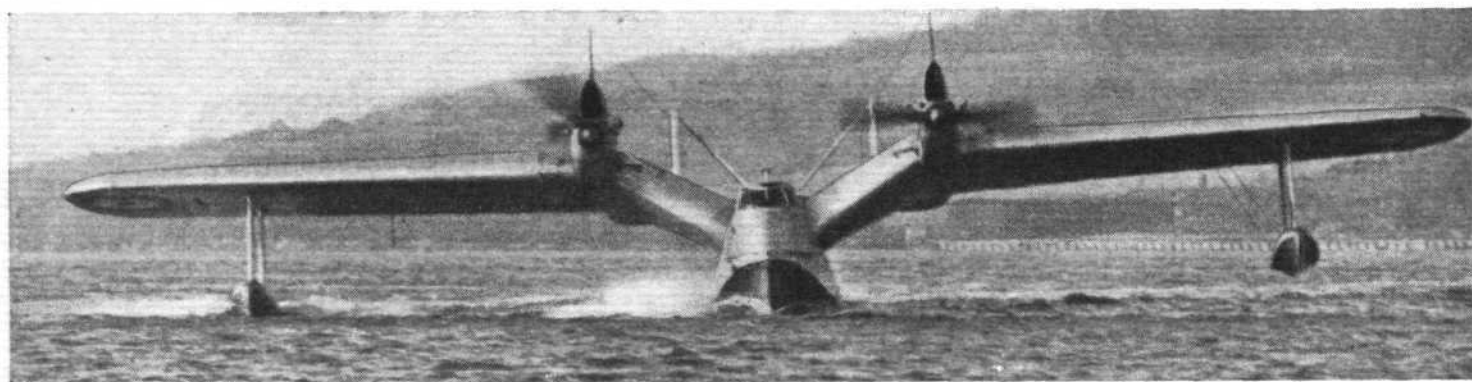
Certain civil types have been built by Boulton and Paul during recent years,

such as the Mailplane and the two "Feeder Line" types, which are at present undergoing their flying tests. These machines are intended for Imperial Airways, and were among those referred to by Sir Eric Geddes in his speech at the annual general meeting of that company.

It might be mentioned that Boulton and Paul, Ltd., have secured sole rights in the Townsend cowling ring for radial aero engines.



A HIGH-PERFORMANCE DAY BOMBER: The Boulton and Paul "Overstrand" (two Bristol "Pegasus" engines). Note the gun turret in the nose of the fuselage.



SHORT BROTHERS, LTD.

From the earliest days of flying this firm has been closely identified with seaplane work. Of recent years the company has rather made a speciality of all-metal flying boats.

SIMILAR in its main essentials to the "Calcutta" civil flying boats used by Imperial Airways, the "Rangoon" is a long-range reconnaissance machine capable of carrying a large military load over a distance of 1,000 miles. No. 203 Flying Boat Squadron of the Royal Air Force is equipped with this boat. The power plant consists of three Bristol "Jupiter" XI F. geared engines, developing 510 h.p. each. Duralumin is used throughout the construction except for certain important units made of stainless steel. The cockpit is completely covered by a safety glass superstructure, a sliding roof being fitted. Sleeping and cooking facilities for the crew are provided.

Another Short military flying boat is the "Singapore" Mark III. This is a high-performance boat designed for long-range open sea reconnaissance. The power plant arrangement differs from

that of the "Rangoon" in that the four Rolls-Royce "Kestrel" water-cooled engines are arranged in tandem pairs, each pair on two single struts. This engine mounting was considered very daring when first produced, but has stood the test of time. There are no wing bracing struts from the chine to the lower plane, a fact which assists towards cleaner running on the water.

The latest type of Short military flying boat is of unusual design. Not only is it a cantilever monoplane, but the wings have a pronounced "bend" in them where the Rolls-Royce "Goshawk" steam-cooled engines are mounted. This "bend" gives the wing a curious gull-like appearance. The raising is due to an endeavour to get the engines and air-screws well clear of the water. On trials the R.24/31, as this machine is called, has proved to have a very fine performance.

SHORT "R24/31"

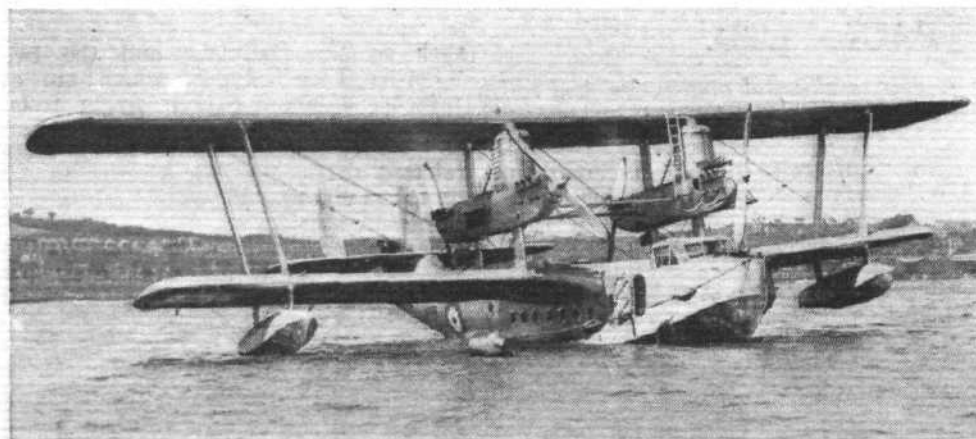
Two 700 h.p. Rolls-Royce "Goshawk"

Type: General Purpose Flying Boat
Length ... 63 ft. 3 in. (19.3 m)
Wing span ... 90 ft. 0 in. (27.4 m)

As this machine is an experimental type, and the property of the British Air Ministry, no weight or performance figures may be published.

Among other flying boats manufactured by Short Brothers, brief mention may be made of the R.6/28, a very large six-engined machine of nearly 5,000 h.p. This is a military type. The "Kent" is a four-engined civil flying boat, with four Bristol "Jupiter" engines, used very successfully by Imperial Airways.

Although mainly associated with fly-



SHORT "SINGAPORE III"

Four 560 h.p. Rolls-Royce "Kestrels"

Type: Long-range Reconnaissance Flying Boat.
Length ... 64 ft. 2 in. (19.52 m)
Wing span: Upper ... 90 ft. 0 in. (27.4 m)
Lower ... 76 ft. 0 in. (23.2 m)
Wing area ... 1,834 sq. ft. (170.5 m²)
Tare weight ... 18,420 lb. (8,360 kg)
Fuel and oil ... 6,275 lb. (2,845 kg)
Military load ... 2,805 lb. (1,272 kg)
Gross weight ... 27,500 lb. (12,477 kg)
Max. gross weight ... 31,500 lb. (14,300 kg)
Max speed ... 145 m.p.h. (233 km/h)
At 2,000 ft. (610 m)
Landing speed ... 65 m.p.h. (105 km/h)
Ceiling ... 15,000 ft. (4,570 m)
Range ... 1,000 miles (1,610 km)
At 105 m.p.h. (168 km/h)

SHORT "SCYLLA"

Four 555 h.p. Bristol "Jupiter" XF. BM

Type: 38-passenger Commercial.
Length ... 83 ft. 10 in. (25.5 m)
Wing span: Upper ... 113 ft. 0 in. (34.4 m)
Lower ... 92 ft. 6 in. (28.2 m)
Wing area ... 2,615 sq. ft. (241 m²)
Tare weight ... 22,650 lb. (10,274 kg)
Disposable load ... 10,850 lb. (4,921 kg)
Gross weight ... 33,500 lb. (15,195 kg)



SHORT "SCION"*Two 90 h.p. Pobjoy "Niagara"*

Type: 6-seater Transport Monoplane.

Length	31 ft. 6 in. (9.6 m)
Wing span	42 ft. 0 in. (12.8 m)
Tare weight	1,710 lb. (775 kg)
Disposable load	1,340 lb. (608 kg)
Gross weight	3,050 lb. (1,383 kg)
Max. speed	125 m.p.h. (200 km/h)
Cruising speed	102 m.p.h. (164 km/h)
Landing speed	50 m.p.h. (80 km/h)
Service ceiling	13,000 ft. (3,970 m)
Range	380 miles (612 km)

The machine is also available as a twin-float seaplane.



ing boat design, Short Brothers have also produced several land planes. Recent types are the "Scylla" four-engined commercial aeroplane, and the "Scion," a small twin-engined monoplane, with accommodation for five passengers.

The "Scylla" has exactly the same superstructure, i.e. wings and engine installation, as the "Kent" class flying boat. A sister plane is named "Syrinx." Both were built for Imperial Airways.

The pilot's cabin is in the extreme nose of the fuselage. Behind it is the forward passengers' cabin, with seating accommodation for ten persons. This compartment is specially designed to permit smoking. In the adjacent space

is located the well-equipped buffet.

Twenty-eight passengers are accommodated in the very large after cabin. The seats are alternately reversed, and a table is provided between each two rows of passengers. The after cabin is 21 ft. 10 in. long, 10 ft. 4 in. mean width, and 7 ft. mean height.

One of the most economical "feeder line" aeroplanes ever built is the little Short "Scion." With two Pobjoy "Niagara" engines of but 90 h.p. each, this machine carries pilot and five passengers at cruising speed of 102 m.p.h. The "Scion" has also been flown as a twin-float seaplane. The pay load is then a little smaller, but the performance is almost the same.

HANDLEY PAGE LTD.

Automatic stability was the aim of Mr. F. Handley Page when he began to experiment in 1910 or so. In more recent times his firm has pursued a similar ideal along different lines, the slot and adjuncts thereto.

ALMOST from the earliest days of flying, or at any rate from 1917 onwards, the name Handley Page has been associated with large aircraft. The firm has designed and built small machines, but the fact remains that the most successful have been large machines.

Fairly recently the firm has received repeat orders for a batch of "Heyfords." These are twin-engined night bombers, the Handley Page works series number being H.P.50.

The "Heyford" is a somewhat unorthodox biplane in that the fuselage is placed immediately under the upper wing, a position which gives a very fine fighting view and field of fire for the crew. The 525 h.p. Rolls-Royce

"Kestrel" engines are also placed under and slightly ahead of the upper wing.

Normally a crew of four is carried: Pilot, navigator, W/T operator, and after gunner. From a fighting point of view perhaps the most interesting feature of the "Heyford" is the rotating gun turret in the fuselage. This turret can be lowered, and is placed some distance behind the trailing edge of the lower wing, so that the gunner obtains a very good position for protecting the tail of the machine. There is no gun position in the extreme stern.

The equipment of the "Heyford" includes an automatic pilot, which on long flights at night or in bad visibility keeps the machine on its course with greater

accuracy than could a human pilot. Also, of course, the automatic pilot relieves the human pilot of a considerable amount of work and fatigue.

Perhaps the best known of recent Handley Page commercial aeroplanes is the type 42, or "Hannibal class," as it is called from the first of these machines delivered to Imperial Airways. This is a four-engined biplane, with two engines placed on the lower wings and two under the upper wings. The cabin of the "Hannibal" is noted for its comfort and absence of noise. It has accommodation for 38 passengers.

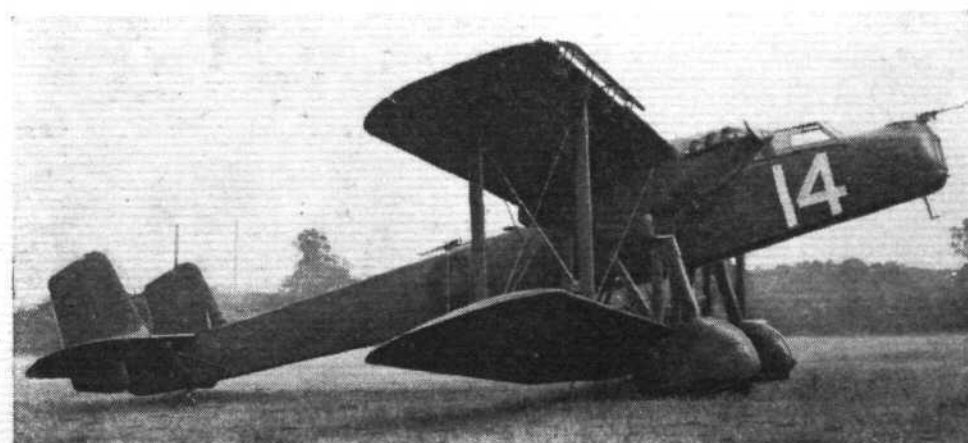
Actually the H.P.42 is used by Imperial Airways in two forms, known as the "Western" and "Eastern" types respectively. The two differ mainly in internal equipment, the "Eastern" type having fewer seats (up to 28), partly to provide more airy cabins for the hot climate, and partly because longer stages have to be covered, which means extra fuel tankage is necessary.

With four "Jupiter" engines the

SHORT "RANGOON"*Three 510 h.p. Bristol "Jupiter" XI F*

Type: Long-range Reconnaissance Flying Boat.

Length	66 ft. 0 in. (20.12 m)
Wing span	Upper ... 93 ft. 0 in. (28.35 m)
	Lower ... 76 ft. 0 in. (23.16 m)
Tare weight	14,000 lb. (6,350 kg)
Disposable load	8,500 lb. (3,856 kg)
Gross weight	22,500 lb. (10,206 kg)
Max. speed	115 m.p.h. (185 km/h)
Cruising speed	95 m.p.h. (153 km/h)
Landing speed	60 m.p.h. (97 km/h)
Climb	550 ft./min. (165 m/min)
Range	1,000 miles (1,609 km)
Absolute ceiling	12,000 ft. (3,658 m)

**HANDLEY PAGE "HEYFORD"***Two 525 h.p. Rolls-Royce "Kestrel III"*

Type: Night Bomber.

Length	58 ft. 0 in. (17.7 m)
Wing span	75 ft. 0 in. (22.9 m)
Weight, loaded	16,750 lb. (7,600 kg)
Max. speed	142 m.p.h. (228 km/h)
	At 13,000 ft. (4,000 m)
Range	920 miles (1,500 km)
Service ceiling	21,000 ft. (6,400 m)

These data relate to the Mark I.

The Mark II has an improved performance.

**HANDLEY PAGE "42"****Four 555 h.p. Bristol "Jupiter" XF.BM**

Type: 38-passenger Transport.

Length	89 ft. 9 in. (27.36 m)
Wing span	130 ft. (39.62 m)
Pay load	9,000 lb. (4 080 kg)
Gross weight	30,000 lb. (13 650 kg)
Max. speed	127 m.p.h. (204 km/h)
Cruising speed	95 m.p.h. (153 km/h)
Landing speed	52 m.p.h. (83 km/h)
Climb	760 ft./min. (3.88 m/sec)

These figures refer to the "Western Type." The "Eastern Type" has Bristol "Jupiter" XI.F's, and carries fewer passengers.

power reserve is such that even with full load the "Hannibal" class is able to continue its flight with any one of the

four engines stopped. Even with two engines out of action, and something less than full load, a considerable distance

can be covered for every 1,000 ft. of altitude, so that hurried forced landings are almost ruled out.

PHILLIPS AND POWIS LTD.

Founded comparatively recently this company produces the very efficient low-wing monoplanes designed by Mr. F. G. Miles, who is very ably assisted by his wife.

EFFICIENCY coupled with reasonable price describes the products of the Phillips, Powis and Miles combination. Mr. Miles has designed monoplanes and biplanes, all very successful, but has now settled down to develop low-wing cantilever monoplanes, two recent types in particular being noteworthy for their performance and the ease with which they can be handled. These are the "Hawk Major" and the "Falcon."

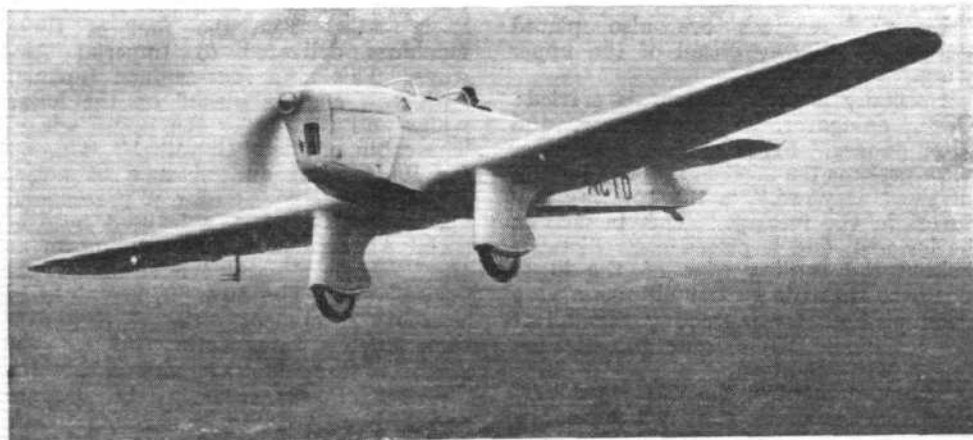
The "Hawk Major" has been developed from the original Miles "Hawk," which it resembles in its

general lines. It is an open two-seater of all-wood construction. The undercarriage is of the "trouser" type, with the tubular forks which support the wheels enclosed in streamline fairings. That the design is clean and the drag low is proved by the fact that with a "Gipsy Major" engine of 130 h.p. the machine has a maximum speed of 150 m.p.h. In the England-Australia race a Miles "Hawk Major" made quite remarkably good time.

A four-seater cabin version of the "Hawk Major" is now available. This

machine resembles the open two-seater in its general lines, but has seating accommodation for pilot and three passengers. The two front seats are separate, and dual control is provided, but the rear seat runs right across the cabin from side to side.

Two alternative power plants have been standardised: the 130 h.p. "Gipsy Major" and the 200 h.p. "Gipsy Six." During test flights at Martlesham it was established that the maximum speed of the "Falcon" with "Gipsy Major" is 148 m.p.h., which must be regarded as remarkably good for the power. With the more powerful engine it is expected that the top speed will be nearly 170 m.p.h. The cruising speeds should be 130 m.p.h. and 150 m.p.h. respectively.

**MILES "HAWK MAJOR"****130 h.p. "Gipsy Major"**

Type: Open 2-seater.

Length	24 ft. 0 in. (7.32 m)
Wing span	33 ft. 0 in. (10 m)
Wing area	169 sq. ft. (15.7 m ²)
Tare weight	1,100 lb. (499 kg)
Disposable load	700 lb. (317 kg)
Gross weight	1,800 lb. (816 kg)
Max. speed	150 m.p.h. (241 km/h)
Cruising speed	135 m.p.h. (217 km/h)
Landing speed	42 m.p.h. (67 km/h)
Range	740 miles (1 190 km)

MILES "FALCON"**130 h.p. "Gipsy Major"**

Type: Cabin 3-4-seater.

Length	25 ft. (7.62 m)
Wing span	35 ft. (10.67 m)
Wing area	174.3 sq. ft. (16.2 m ²)
Tare weight	1,300 lb. (590 kg)
Disposable load	1,000 lb. (454 kg)
Gross weight	2,300 lb. (1 044 kg)
Max. speed	148 m.p.h. (238 km/h)
Cruising speed	130 m.p.h. (209 km/h)



SARO "A.27"*Two 580 h.p. Bristol "Pegasus"*

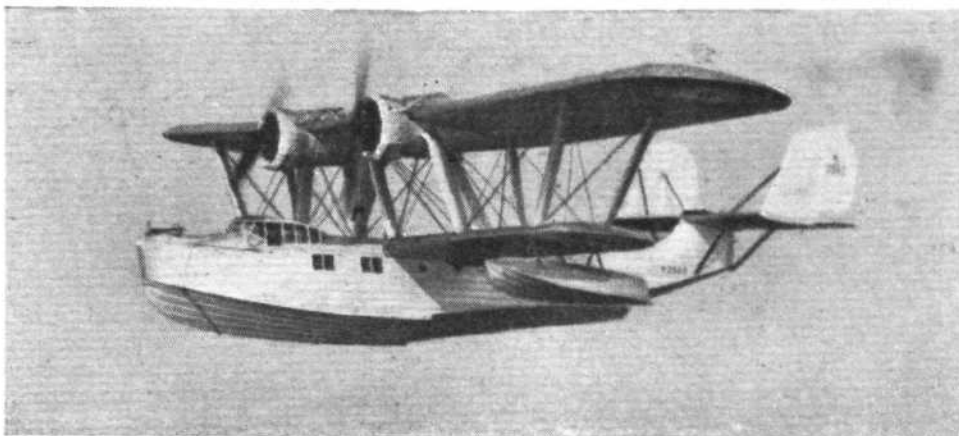
Type: General Purpose Flying Boat.

Length: ... 56 ft. 6 in. (17.2 m)

Wing span ... 80 ft. 0 in. (24.4 m)

Height ... 18 ft. 9 in. (5.7 m)

As the machine is an experimental type and the property of the Air Ministry, no weight or performance data may be given.

**SAUNDERS-ROE LTD.**

Several years ago Sir Alliott Verdon-Roe and his old friend and partner, Mr. John Lord, took over the boat-building business of S. E. Saunders. Since then they have developed, under the name Saro, a progressive flying-boat business.

A SMALL civil four-seater flying boat, the "Cutty Sark," was the first type to be produced several years ago by Saunders-Roe. Since then the firm has added to the range, and a whole "family" is now available. Of these we can refer here to but two, The "A.27" and the "Cloud."

The Saro "A.27" is a twin-engined all-metal general purpose flying boat designed to an Air Ministry specification. The machine is an unequal-span biplane, with an "Alclad" hull having straight sides and a straight vee bottom. The two 580 h.p. "Pegasus" engines are mounted in streamline nacelles below the upper wing, where they are well clear of spray. Beyond the fact that the machine has

a wing span of 80 ft. (24.4 m.), it is not permissible to publish data.

Two standard versions of the Saro "Cloud" have been produced, one with two 340 h.p. Siddeley "Serval" engines, and the other with two 340 h.p. Napier "Rapier" VI engines. In addition, the "Cloud" can be supplied either as an amphibian or as a plain flying boat. In the former the pay load is slightly smaller, and the performance not quite so good, but of course the machine is able to operate from either land or water, sometimes a very great advantage.

The "Cloud" can be equipped in several ways, according to the use to which it is being put. As a civil type

it can have passenger accommodation for up to eight passengers. When used, as it has been by the British Royal Air Force, for training flying boat pilots in flying and navigation, wireless, etc., the cabin equipment is, of course, adapted to the particular needs of the moment.

The machine is of composite construction, with a flat-sided hull having "Alclad" planking. This planking is provided with fore-and-aft corrugations, which form of construction avoids the need for internal stringers and greatly simplifies the construction. The wing is of wood, with plywood covering.

Apart from its other uses, the land undercarriage is very useful when picking up moorings in that the wheels, when lowered, form a very effective drogue. Where a beach or slipway is available, the machine is simply taxied up under its own power. Wheel brakes are fitted, so that manœuvring on the ground is readily carried out even in confined spaces.

**SARO "CLOUD"***Two 340 h.p. Napier "Rapier"*

Type: 6-7-passenger Amphibian.

Length ... 49 ft. 9 in. (15.17 m)

Wing span ... 64 ft. 0 in. (19.51 m)

Wing area ... 650 sq. ft. (60.39 m²)

Tare weight ... 6,450 lb. (2,928 kg)

Disposable load ... 3,250 lb. (1,475 kg)

Gross weight ... 9,700 lb. (4,403 kg)

Max. speed ... 121 m.p.h. (194 km/h)

Cruising speed ... 102 m.p.h. (164 km/h)

Climb ... 800 ft./min. (4.08 m/sec)

Ceiling ... 15,000 ft. (4,500 m)

Range (with 8 passengers) ... 408 miles (656 km)

PERCIVAL AIRCRAFT COMPANY

Capt. E. W. Percival came to England some years ago from Australia, where he had had considerable experience of air transport and aviation generally. He has now established himself as an aircraft designer and constructor.

WOOD construction has been adopted in all the machines designed by Mr. Percival, being light for its strength and easy to repair by almost anyone in case of damage. In aerodynamic design Mr. Percival favours the low-wing monoplane as giving low drag, and the performance attained by his machine indicates the soundness of his choice.

The "Gull" is a high-performance three-seater intended for the private

owner, for taxi services, and so forth. The pilot sits in front with the two passengers behind him in slightly staggered seats. A cabin roof is provided, having sliding windows the whole length of the cabin on both sides. Behind the rear seat there is a luggage locker fitted with doors which give access from the cabin during flight or from outside when the machine is on the ground. The cabin space is entirely free from control rods

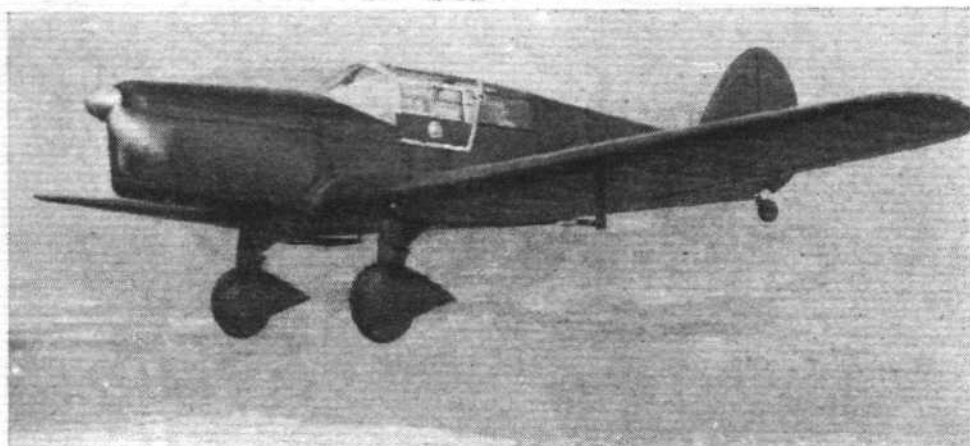
and cables, so that passengers need not worry about placing their feet.

An undercarriage of the "split" type is fitted, the wheels being carried on semi-cantilever legs, and enclosed in "spats." Wheel brakes are fitted as standard.

Various power units can be fitted, such as the "Gipsy Major," the "Gipsy Six," the "Cirrus-Hermes IV," and the Napier "Javelin." The performance varies slightly according to the type of engine, but is always high.

For storage purposes the wings are arranged to fold, the hinge being on the rear main spar.

A machine with even greater performance is the Percival "Mew Gull," which



PERCIVAL "MEW GULL"

200 h.p. "Gipsy-Six"

Type: High-speed Single Seater.

Length ...	18 ft. 3 in. (6.25 m)
Wing span ...	24 ft. 0 in. (7.32 m)
Wing area ...	78 sq. ft. (7.25 m ²)
Tare weight ...	1,040 lb. (472 kg)
Disposable load ...	505 lb. (229 kg)
Gross weight ...	1,545 lb. (700 kg)
Max. speed ...	204 m.p.h. (328 km/h)
Cruising speed ...	180 m.p.h. (290 km/h)

is a single-seater with the pilot placed very far back in the fuselage. This placing reduces air resistance, as the depth of fuselage at the back merges into the fin, and the break at the wind-



PERCIVAL "GULL"

200 h.p. "Gipsy-Six"

Type: 3-seater Cabin Monoplane.

Length ...	25 ft. 0 in. (7.62 m)
Wing span ...	36 ft. 0 in. (10.97 m)
Wing area ...	169 sq. ft. (15.7 m ²)
Tare weight ...	1,400 lb. (662 kg)
Disposable load ...	840 lb. (381 kg)
Gross weight ...	2,300 lb. (1,043 kg)
Max. speed ...	166 m.p.h. (267 km/h)
Cruising speed ...	150 m.p.h. (241 km/h)
Standard tankage ...	31.5 galls. (143 litres)
Range with standard tank ...	500 miles (805 km)

The machine is also available with Napier "Javelin" and "Cirrus-Hermes IV" or "Gipsy Major" engines.

screen has less effect than if placed further forward.

With a "Gipsy Six" engine the "Mew Gull" has a speed in excess of 200 m.p.h.

The machine is mainly a racing type, but actually it could be used for the rapid conveyance of Press photographs, or even for air mails, as it would carry 3,000 letters 500 miles.

WESTLAND AIRCRAFT WORKS LTD.

Established as a branch of Petters, Limited, the well-known oil-engine manufacturers, during the war, the Westland Aircraft Works have produced very large numbers of machines for the R.A.F. A strong Experimental Section is part of the firm's policy, and some highly interesting unorthodox types have been produced.

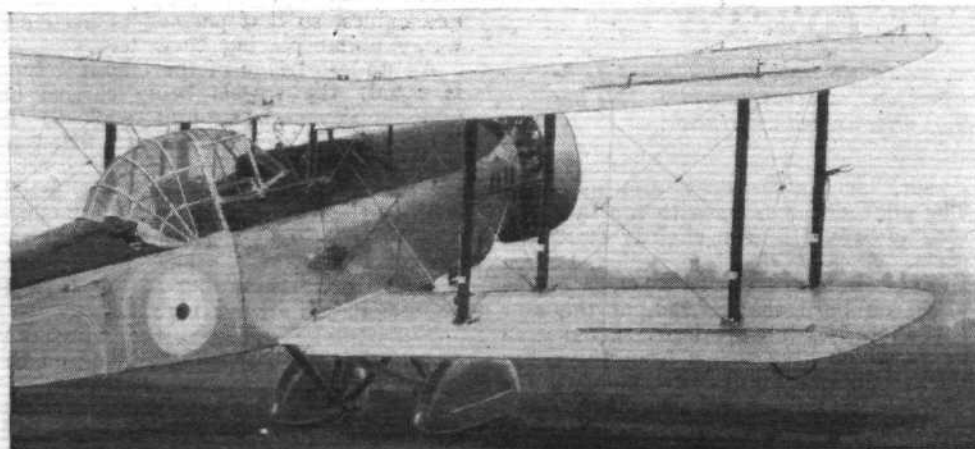
A LARGE number of Westland "Wallaces" have been supplied to, and are still under construction for, the British Royal Air Force. The machine is a general-purpose aircraft, developed from and rather similar to, the famous Westland "Wapiti," of which hundreds were supplied to the British and Australian Air Forces. The "Wallace" has now been still further improved, and can

be supplied with any of the following Bristol "Pegasus" engines: Mark I.M.3, Mark II.M.3, or Mark III.M.3. With the Mark III the performance is particularly good, 166 m.p.h. at 3,500 ft., and a climb of 20,000 ft. in 20 minutes.

An interesting feature introduced on the "Wallace" is the enclosed cockpit for the rear gunner. The roof over the

gunner is transparent, and can be opened by separate segments, which can be locked in any position. This cockpit protects the gunner against the air stream, and enables him to work his gun quickly, even at full speed. The transparent roof and sides extend forward over the pilot's cockpit also, which has a further advantage in that it reduces the noise and facilitates communication between pilot and gunner.

During the past summer the Westland Aircraft Works introduced a very interesting single-seater day and night fighter. This machine is a biplane in which the engine is placed, not in the nose of the fuselage, as is customary, but in the space usually occupied by the



WESTLAND "WALLACE"

670 h.p. Bristol "Pegasus" III.M.3

Type: General Purpose Aircraft.

Tare weight ...	3,880 lb. (1,760 kg)
Military load ...	1,090 lb. (494 kg)
Fuel and oil ...	780 lb. (354 kg)
Total weight ...	5,750 lb. (2,608 kg)
Max. speed ...	166 m.p.h. (267 km/h)
At 3,500 ft. (1,067 m)	
Time to ...	20,000 ft. (6,096 m), 20.5 min.
Service ceiling ...	25,500 ft. (7,772 m)
Range:	
Normal (105 galls.) ...	520 miles (837 km)
Desert (130 galls.) ...	640 miles (1,030 km)
Long (250 galls.) ...	1,230 miles (1,980 km)

UNORTHODOXY: The Westland-Hill "Pterodactyl V" (Rolls-Royce "Goshawk") is a two-seater fighter.

petrol tank, i.e. in the fuselage, between the wings. An extension shaft runs from the engine to the airscrew, the latter being placed in the normal position.

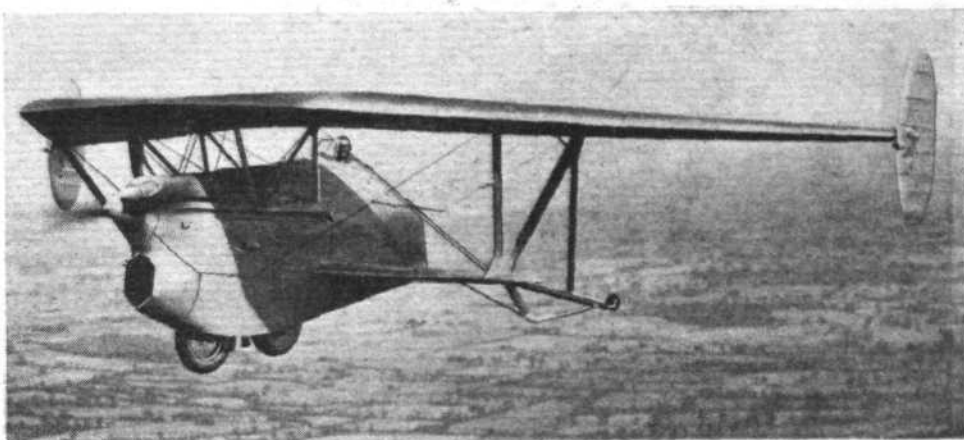
The pilot is situated in front of the leading edge of the upper wing, in a raised position. Owing to the down-swept upper wing roots he can look back over the fuselage, and from his seat above and in front of the engine he obtains a fine view in a forward direction also. In fact, it may be said that this machine combines pusher view with tractor performance. The engine is a steam-cooled Rolls-Royce "Goshawk" of 600 h.p.

Some ten years ago Capt. G. T. R. Hill began to experiment with "tailless" aeroplanes. After a time he joined forces with the Westland Aircraft Works, and the latest tailless type to be produced is a two-seater fighter known as the "Pterodactyl V." This machine is by far the most powerful tailless ever produced, and has a performance comparable with that of orthodox aircraft

SHAFT DRIVE: In the Westland Day and Night Fighter, the Rolls-Royce "Goshawk" engine is placed in the middle of the fuselage.

of the same power. The engine is a steam-cooled Rolls-Royce "Goshawk."

The machine is a "Sesquiplane," i.e. has a large top plane and a diminutive lower wing. The main plane is swept



back, so that both pilot and gunner are seated behind the wing, the gunner on a lower level than the pilot. Owing to the absence of a tail the rearward field of fire is quite remarkable. Flying tests

of the "Pterodactyl V" are now proceeding, and some very interesting results are being obtained. A novel feature is the partly enclosed undercarriage, with the wheels in tandem.

THE BRISTOL AEROPLANE CO., LTD.

Established by the late Sir George White, in the very earliest days of aviation, the name "Bristol" has now become world famous, the firm's products being widely known for their high quality.

DEVELOPED from the "Bulldog" Mark II, which was the standard single-seater fighter of the R.A.F., and was used also by Sweden, Denmark, Australia, Latvia, Esthonia, and Siam, the "Bulldog" Mark IV incorporates such experience as has been accumulated during prolonged service. The result is a general purpose Day and Night fighter with a remarkably good performance and no vices. The arma-

ment consists of two Vickers guns, one placed on each side of the cockpit in such a position that jams can be cleared without difficulty, and provision is also made for carrying bombs. Wireless equipment is included, as well as oxygen apparatus, the machine being designed to operate at considerable altitudes.

All-steel construction is employed, the fuselage being a girder composed of cir-

cular-section and built-up tubes. The main wing spars are of corrugated steel strip, secured by interlocking edges and not by riveting.

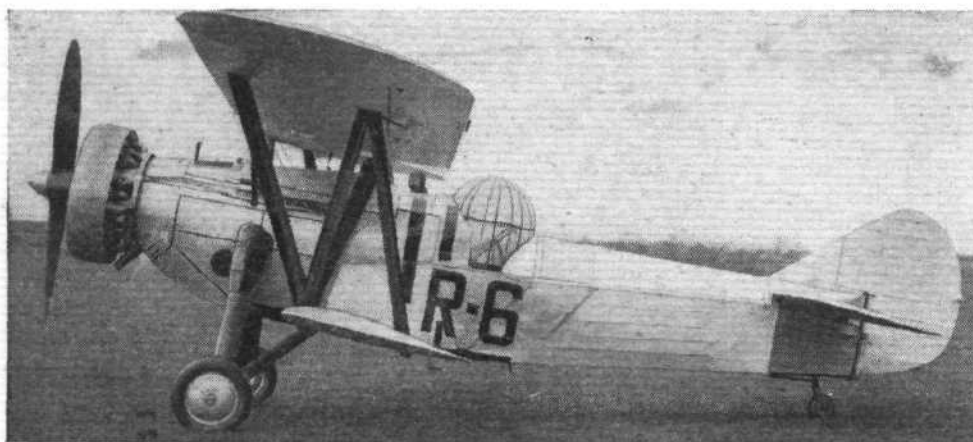
The engine fitted in the "Bulldog IV" is the Bristol "Mercury" V.I.S.2, a fully supercharged engine, the rated altitude of which is 12,500 ft., at which height the normal power developed is 605 m.p.h. Fuel is carried in two tanks in the upper wing, whence it flows to the engine by the force of gravity. The greatest speed is attained at a height of about 16,000 ft., and is 208.5 m.p.h.

Of the so-called General Purpose type, the Bristol Type 120 has been designed with a view to undertaking any of the



BRISTOL "BULLDOG," MARK IV 600 h.p. "Mercury" V.I.S.2

Type:	High-altitude Day and Night Fighter.
Length	25 ft. 2½ in. (7.68 m)
Wing span: Upper	33 ft. 8 in. (10.25 m)
Lower	27 ft. 6 in. (8.38 m)
Wing area	294 sq. ft. (27.3 m²)
Tare weight	2,810 lb. (1,274 kg)
Fixed equipment	25 lb. (55 kg)
Military load	1,165 lb. (529 kg)
Gross weight	4,100 lb. (1,858 kg)
Max. speed:	
	208 m.p.h. at 16,000 ft. (335 km/h at 4,880 m)
Climb	20,000 ft. (6,100 m) in 13.5 mins.
Service ceiling	30,550 ft. (9,310 m)

**BRISTOL TYPE 120****580 h.p. Bristol "Pegasus" M.2**

Type: General Purpose Biplane.

Length	...	34 ft. 6 in. (10.36 m)
Wing span: Upper	...	40 ft. 8 in. (12.40 m)
Lower	...	28 ft. 8 in. (8.74 m)
Tare weight	...	3,632 lb. (1,647 kg)
Fuel and oil	...	890 lb. (404 kg)
Military load	...	678 lb. (308 kg)
Gross weight	...	5,200 lb. (2,359 kg)

following five duties: fighting, bombing, army co-operation, photography, and ambulance work. A feature of the machine is the arrangement of the wing structure, which is rigidly braced by struts, no wires being used. Another interesting innovation is the introduction of an enclosed transparent cockpit for the rear gunner to enable him to work his gun even while the machine is flying

at full speed. When the gun is not in use the turret is closed. A vertical slot in the turret permits of elevating and depressing the gun, while traversing is done by rotating the gun ring, which carries the turret with it.

The pilot is placed fairly high in the fuselage, and there is room under his cockpit for the gunner to go forward to the bombing station, which is right up

inside the forward end of the fuselage.

Racks on the lower wings are arranged to carry the bombs, which may be 20lb., 112lb., 230lb., 250lb., or 500lb., the number, of course, depending on the weight of each bomb. In general the total bomb load will be in the neighbourhood of 500lb.

The pilot's armament consists of a .303 Vickers gun, fired by C.C. gear.

GENERAL AIRCRAFT LIMITED

The origin of this company is to be found in the invention by Mr. H. J. Stieger of a form of wing construction using but a single main spar. This type of construction has become known as the "Monospar" construction, and is used in all the firm's aeroplanes.

BRIEFLY explained, the Stieger "Monospar" system of wing construction consists in using a single main spar, placed in the deepest part of the wing section, the spar being strong enough in itself to resist the bending loads, and torsional stiffness being given to it by two tension helices of bracing wire running in opposite directions. A similar system is used in the fuselage

primary structure. It is claimed that a considerable weight saving can be effected in this manner.

Three types are at present marketed. The S.T.4, the S.T.10, and the S.T.11. Other types are being developed.

To be regarded as the prototype, the S.T.4 is a twin-engined four-seater low-wing monoplane of all-metal construction, powered by two Pobjoy "Niagara"

engines of 90 h.p. each. The S.T.10 is generally similar, but with structural modifications which enable retractable undercarriages to be fitted. Also there are certain refinements not found in the S.T.4.

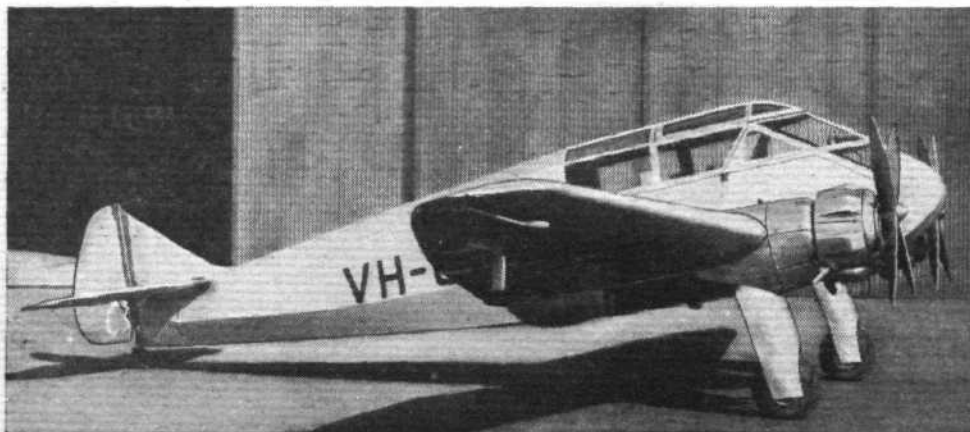
When the retractable undercarriage is fitted, the machine becomes the S.T.11. The standard equipment is rather more comprehensive than that of the S.T.10, and includes Reid and Sigrist pitch and turn indicators, navigation lights, etc.

A good feature of the design of all three types is the exceptionally good view obtained by placing the pilot well forward in a very pointed nose, where there are no obstructions to vision.

MONOSPAR S.T.10**Two 90 h.p. Pobjoy "Niagara"**

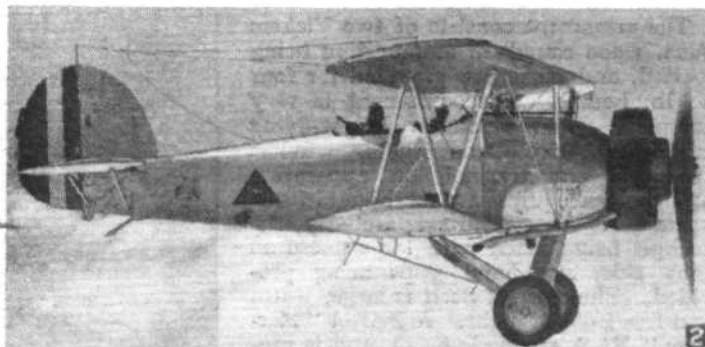
Type: 4-seater Cabin Monoplane.

Length	...	26 ft. 4 in. (8.03 m)
Wing span	...	40 ft. 2 in. (12.24 m)
Wing area	...	217 sq. ft. (20.2 m ²)
Tare weight	...	1,470 lb. (668 kg)
Fuel and oil	...	330 lb. (150 kg)
Pilot and 3 passengers	...	640 lb. (291 kg)
Luggage	...	110 lb. (50 kg)
Gross weight	...	2,550 lb. (1,159 kg)
Max. speed	...	142 m.p.h. (228 km/h)
Cruising speed	...	130 m.p.h. (209 km/h)
Landing speed	...	48 m.p.h. (77 km/h)
Range	...	585 miles (940 km)
Climb	...	900 ft./min. (4.6 m/sec)

**MONOSPAR S.T.11****Two 90 h.p. Pobjoy "Niagara"**

Type: 4-seater Cabin Monoplane.

Length	...	26 ft. 4 in. (8.03 m)
Wing span	...	40 ft. 2 in. (12.24 m)
Wing area	...	217 sq. ft. (20.2 m ²)
Tare weight	...	1,524 lb. (692 kg)
Disposable load	...	1,026 lb. (465 kg)
Gross weight	...	2,550 lb. (1,159 kg)
Max. speed	...	155 m.p.h. (249 km/h)
Cruising speed	...	142 m.p.h. (228 km/h)
Landing speed	...	48 m.p.h. (77 km/h)
Climb	...	970 ft./min. (4.95 m/sec)
Service ceiling	...	17,400 ft. (5,310 m)
Range	...	640 miles (1,030 km)



FOREIGN APPRECIATION: Three of the Hawker types supplied to foreign air forces. 1: A "Hart" ("Pegasus") bearing the three crowns of Sweden. 2: An Iraqi "Audax" ("Pegasus"). 3: A Portuguese "Fury" ("Kestrel").

HAWKER AIRCRAFT LTD.

A descendant of the famous old Sopwith firm, this company produces machines that have attained a world-wide reputation. Some time ago Hawker Aircraft Ltd., joined forces with the Gloster Aircraft Co., Ltd., and now the two firms work in very close co-operation.

THE extent to which Hawker aircraft are used in the British Royal Air Force, the Fleet Air Arm, and in the air forces of foreign nations, is an indication of the esteem in which the products of this company are held both at home and abroad. Even granting that many of the types are variations of other types, the list is formidable.

At home the following Hawker types are in service: The "Hart" Day-bomber, the "Hart" Advanced Training type, the "Hind" High-altitude Day-bomber, the "Audax" Army Co-operation type, the "Demon" Two-seater fighter, the "Hardy" General Purpose type, the "Osprey" Two-seater Fleet Fighter Reconnaissance Deck Landing and Catapulting type, the "Fury" Interceptor Fighter, and the "Nimrod" Fleet Fighter Deck-landing and Catapulting type. All these types are fitted with the Rolls-Royce "Kestrel" engine.

The list of countries to which Hawker aircraft have been supplied includes the following: Denmark, Estonia, Greece, Japan, Persia, Portugal, Yugoslavia, Iraq, and Sweden. Abroad there is not

the same unanimity about power plants, the Hawker machines supplied to the countries mentioned above having been fitted with such a variety of engines as the Rolls-Royce "Kestrel," the Siddeley "Panther" and "Leopard," the Bristol "Pegasus" and "Mercury," the Pratt and Whitney "Hornet," and the Hispano-Suiza engine. All these machines have given as good results abroad as have those used at home.

It is difficult to point to any one feature and say that is the reason for the popularity of Hawker aircraft. High performance and good manœuvrability and control are, perhaps, the outstanding characteristics, but the simple forms of construction adopted, which not only facilitate production in the first instance but permit ready repairs in service, have contributed materially to the general adoption of these machines.

The Hawker types in service with the Royal Air Force and Fleet Air Arm are so well known that it has been considered of more interest to illustrate some less standard types. Consequently our photographs show machines delivered to Iraq, Sweden and Portugal.

GLOSTER

Originally founded by Mr. D. Longden, the Gloster Aircraft Co., Ltd., has now become associated with Hawker Aircraft Ltd. It still maintains its own design staff and works.

DEVELOPED from the Gloster "S.S.19," the Gloster "Gauntlet" is the latest single-seater fighter to be adopted by the British Air Ministry. It differs from the majority of aeroplanes in this class in being a two-bay biplane, most others having a single pair of inter-plane struts on each side. The use of two pairs of struts has reduced the length of wing spars between supports, and gives a better angle to the lift and landing wires, so that the compression loads which these wires add to the plain bending loads are relatively small. The result is that the wing structure is very strong and rigid.

Needless to say, the machine is of all-metal construction. The fuselage is of tubular construction, with square-section tubes in front and round tubes with "wrapper plate" joints at the back. The wings have spars of corrugated steel strip, and most of the wing ribs of duralumin.

GLOSTER "GAUNTLET"

600 h.p. Bristol "Mercury" VI S.

Type:	Single-seater Day and Night Fighter.
Length	26 ft. 2 in. (7.98 m)
Wing span: Upper	32 ft. 10 in. (10.02 m)
Lower	32 ft. 10 in. (10.02 m)
Wing area	315 sq. ft. (29.26 m ²)
Petrol capacity	80.5 galls. (364 litres)
Oil capacity	5 galls. (22.75 litres)
Gross weight	3,950 lb. (1,790 kg)
Maximum speed:	
	230 m.p.h. at 15,800 ft. (370 km/h at 4,820 m)
Stalling speed	59 m.p.h. (95 km/h)
Climb to	15,000 ft. (4,572 m), 6.25 min.
Climb to	20,000 ft. (6,096 m), 9.2 min.
Service ceiling	35,500 ft. (10,800 m)



The armament consists of two Vickers guns, 1,200 rounds of ammunition being carried, and racks are provided for four 20 lb. bombs. The equipment is very complete, and includes night-flying equipment, navigation lights, wireless reception and transmission apparatus, and oxygen equipment for high-altitude operation. Entry and exit are easy, the cockpit being fitted with large doors on each side, and hand grips being provided. The cockpit itself is large, warm and free from draught. A Bristol "Mercury" VI S. engine is fitted, and is provided with a Townend ring. This engine is fully supercharged, so that the "Gauntlet" has the remarkably high speed of 230 m.p.h. at 15,800 ft.

Of quite recent introduction is the Gloster "F.7/30." This machine, a "Private Venture," has been built to conform to the latest requirements of the British Air Ministry for a high-speed single-seater Day and Night Fighter. It is a direct development of the "Gaunt-



A "PRIVATE VENTURE": The Gloster F.7/30 ("Mercury" VI S.) Day and Night Fighter.

let," and although it is not possible at present to publish full particulars, it can be stated that even with the same engine as that of the "Gauntlet," the performance of the new machine is better in

every respect, although the gross weight is greater. Clean design has been aimed at, and the accompanying photograph indicates to what extent it has been achieved.

BRITISH KLEMM

The Klemm monoplane was first introduced into England five years ago by Major E. F. Stephen. The British Klemm Aeroplane Co., Ltd., has the sole manufacturing and selling rights for Great Britain and the British Dominions.

ABSENCE of vices of any sort was ever a prominent characteristic of Klemm monoplanes, and the British products, although they differ somewhat in several respects from the German original, have retained this feature. At the present time two models have been standardised: The "Eagle" cabin three-seater and the "Swallow" open two-seater.

Wood is the chief structural material used in the Klemm "Eagle." The fuselage as well as the wings is covered with plywood, and the primary structure inside both is also of wood.

A very comfortable cabin is provided, with the pilot occupying a single seat in front, whence he has an excellent view, and the two passengers side by side behind.

The wings of the "Eagle" are of the cantilever type, and are arranged to fold. The undercarriage is of wide track, and retracts into the wings by swinging the wheels outwards. In the raised position the wheels are fully housed in recesses in the wings.

Two power plants have been standardised: The de Havilland "Gipsy Major" of 130 h.p. and the "Gipsy

Six" of 200 h.p. With the former, the machine cruises at 125 m.p.h., and with the latter the cruising speed is increased to about 148 m.p.h.

Of lower power is the Klemm "Swallow," which is an open two-seater fitted with the 70-75 h.p. British Salmon engine or the 75-80 h.p. Pobjoy "Cataract." The former model is 30lb. heavier than the latter, which means that for the same gross weight of 1,500 lb. the disposable load is smaller by that amount. Otherwise there is little difference between the two models.

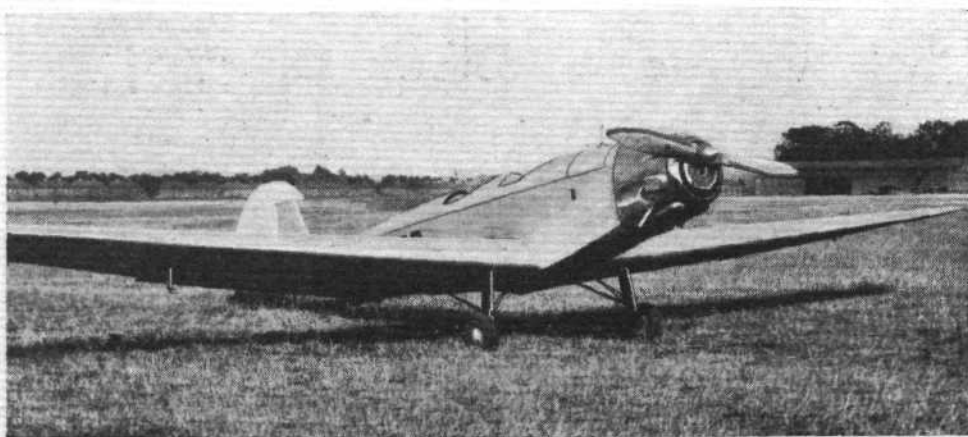
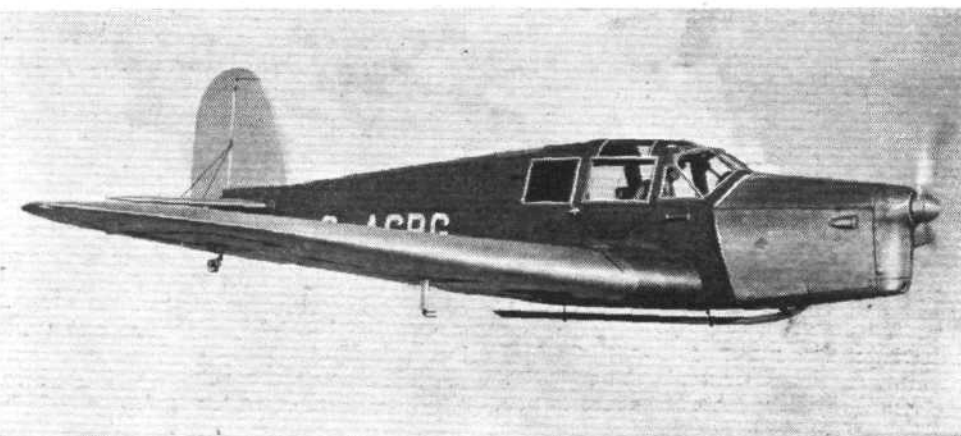
The "Swallow" is, like the "Eagle," of all-wood construction. The undercarriage does not retract, but is of low drag. The wings fold, and the machine is easily handled on the ground by one man.

BRITISH KLEMM "EAGLE"

130 h.p. "Gipsy Major"

Type: 3-seater Cabin Monoplane.

Length	26 ft. 0 in. (7.9 m)
Wing span	39 ft. 3 in. (12.0 m)
Wing area	200 sq. ft. (18.6 m ²)
Tare weight	1,350 lb. (614 kg)
Pilot	160 lb. (73 kg)
Fuel and oil	299 lb. (135 kg)
Two passengers and luggage	491 lb. (224 kg)
Gross weight	2,300 lb. (1,046 kg)
Max. speed	148 m.p.h. (236 km/h)
Cruising speed	130 m.p.h. (208 km/h)
Landing speed	45 m.p.h. (72 km/h)
Climb	700 ft./min. (3.57 m/sec)
Range	650 miles (1,040 km)



BRITISH KLEMM "SWALLOW"

80 h.p. Pobjoy "Cataract"

Type: Open 2-seater Monoplane.

Length	26 ft. 3 in. (8.0 m)
Wing span	42 ft. 8 in. (13.0 m)
Wing area	219.5 sq. ft. (20.4 m ²)
Tare weight	930 lb. (424 kg)
Pilot	160 lb. (73 kg)
Fuel and oil	161 lb. (74 kg)
Passenger and luggage	249 lb. (112 kg)
Gross weight	1,500 lb. (683 kg)
Max. speed	110 m.p.h. (176 km/h)
Cruising speed	98 m.p.h. (157 km/h)
Landing speed	32 m.p.h. (51 km/h)
Climb	800 ft./min. (4 m/sec)
Range	420 miles (670 km)

PRIVATE FLYING

A SECTION FOR OWNER-PILOTS
AND CLUB MEMBERS

HAVING overhauled and equipped my machine to my own satisfaction, I took the opportunity of testing it out on a business trip to the Continent before finally setting off on my Far Eastern tour. This involved visiting a number of aerodromes in Belgium and Germany, and it may be interesting to give a few particulars of these.

My first stop was Ostend, which is a military and civil Customs aerodrome. The grass surface is level, but there is a rough strip on the S.E. boundary which should be avoided. The hangars are very much in line with the prevailing wind, so care is necessary when taking off, as they are not too easy to clear. The town can be reached in ten minutes by taxi, which costs about thirty francs. Customs facilities are available on weekdays and Sundays alike, and meteorological information can be obtained on the aerodrome.

My next visit was to that fine old town of Antwerp, which was a prosperous commercial centre in the eleventh century. Here lived the foremost Flemish painters, of whom Rubens was the chief, many of whose most important works are to be found in the magnificent Gothic cathedral. The aerodrome at Antwerp has full Customs facilities and is large, being eight hundred by a thousand metres. It is well drained and level, with a good grass surface. The main aerodrome buildings are well laid out, and I was able to obtain the fuel I wanted. One criticism which might be made from the owner-pilot's point of view is that after landing near the Customs office—as I was staying overnight—it was found necessary to taxi at least half a mile to the hangar on the other side of the aerodrome, where private machines are accommodated. As there are no fuelling facilities near this point, this taxiing had to be repeated when leaving, which is not at all a satisfactory arrangement. It was interesting to note the prevalence of light aircraft of English make. This is due to the fact that De Havilland's have a very live agent who also runs an excellent flying school.

A Call at Brussels

FROM Antwerp I intended to fly into Germany, but, having to pick up something which had been sent from England, I looked in at Brussels. The aerodrome there is, again, both a military and civil Customs airport. It is not an ideal landing ground, as it has an undulating surface, and after rain tends to become heavy, especially on the eastern side. Belgian aviation owes a good deal to the example set by the Royal Family, the late King Albert, in particular, having been an enthusiastic air traveller. Although one of the smallest countries in Europe, it is well to the fore in commercial air transport, nearly 800,000 miles having been flown on its regular air services during 1933.

These figures are small compared with German returns, which, of course reflect the greatest volume of air traffic of any one European country. Air transport services

in that country covered a mileage of six and a half millions during 1933, and the returns for the first six months of 1934 show an increase of nearly sixty per cent. of passengers carried over the corresponding period of 1933.

These figures are but an indication of the thoroughness of German air organisation, coupled with the flying enthusiasm of the German people. The network of internal airways in that country is the densest in Europe, more than fifty towns being served by regular air services run by the Deutsche Luft Hansa. During the summer of 1933

twenty-six air lines were operated daily from Berlin. As may be imagined, private flying has gained much from the facilities thus made available.

I have flown a good deal in Germany, and one cannot help being impressed by the air-mindedness of the average German citizen. On this occasion my journey took me *via* Cologne, Frankfurt and Mannheim. Cologne has a splendid aerodrome, and Customs facilities are very good. Private machines seem specially catered for in this respect, as they can be cleared at all hours by the aerodrome police. I have found it a

feature of the main German airports that one can rely on very expeditious Customs clearances, and reliable meteorological information, too, can usually be obtained. At Cologne good hangar accommodation is usually available, but the aerodrome itself is some little distance from the town, taxis taking about 25 minutes. Within easy reach of Cologne is some of the most beautiful scenery of the Rhine, and the old university town of Bonn is near by.

Frankfort's Modern Aerodrome

FRANKFORT-ON-MAIN, the original home of the Rothschilds and the birthplace of Goethe, is worth a visit. It is served by a very fine aerodrome, one thousand by eight hundred metres in extent. It has an excellent grass surface and, being 300ft. above sea level, is never waterlogged. All the aerodrome buildings are of modern design, and there is a very fine hotel and restaurant. The amenities at these German airports are such that people are encouraged to visit them at all times.

In the case of Frankfurt, the airport is only a ten minutes' drive of the town. There is no doubt that the success of aviation in Germany is largely due to concentrating first on adequate ground organisation, which has been made possible by the whole-hearted co-operation of the municipal authorities.

My last port of call was Mannheim, one of the most important commercial centres of South Germany. Just to the north of this city lies Worms, the oldest town in Germany. Its romanesque cathedral, founded nearly a thousand years ago, is one of the architectural gems of the Rhineland. A few miles to the south-east, along the valley of the Neckar, lies the famous university town of Heidelberg. Mannheim aerodrome, although not very large, is quite a good landing ground with excellent hangarage. It has Customs facilities and is fairly near to the town.

NOTES

by

LORD SEMPILL

A.F.C., F.R.Ae.S.

Private Flying**FROM THE CLUBS***Events and Activity at the Clubs and Schools***YORKSHIRE AVIATION SERVICES**

The clubhouse at Newton House Hotel Aerodrome is now complete, and a second and larger hangar has been erected. Workshops and a flying manager's office are, too, among the recent additions.

Five new pupils joined the Yorkshire Aviation Services' school during October, and another pupil has purchased an Avro "Avian," which is being overhauled in the workshops.

HANWORTH

The total flying for the week was 24 hr. 50 min., and this, after allowing for three non-flying days, is a fairly good figure. The next dinner-dance is on Saturday, December 1, and early booking for tables is advisable.

Amongst the many new private owners now at Hanworth is Mr. C. A. Anson, whose "Rapide Dragon" can often be seen flying in the hands of Mr. Woods, once chief pilot to Hillman Airways, Ltd.

NORTH STAFFORDSHIRE

The club has now been officially recognised, for purposes of subsidy, by the Air Ministry, and all flying rates have consequently been reduced.

The flying time during September, which included a trip to Devonshire by the Earl of Shrewsbury, exceeded 35 hr., and Mr. R. J. Wenger obtained his "A" licence. October flying time has been adversely affected by bad weather, but Mr. A. G. Ellis passed his tests, and Mr. E. Peach took his licence.

The club's second annual ball will be held at the Crown Hotel, Stone, Staffs, to-morrow.

YORK COUNTY

The York County Aviation Club, Ltd., of Sherburn-in-Elmet, held a successful dinner-dance on November 7, when more than 150 members and their friends were present.

Model aircraft, "props.," and miniature wind socks helped to give the right atmosphere, and music was supplied by Barry Constable and his orchestra. The "In Town To-night" cabaret entertainment included Mona Vivian, who worked club characters into her songs, and Giovanni, the famous illusionist, who succeeded in taking almost all they had except their characters.

IRISH AERO

During the past three weeks the Irish Aero Club has done 45 hr. dual and 25 hr. solo. Four new members have joined.

The dance on Friday, November 2, was a huge success. More than 500 people attended, and two Ministers—Mr. Lemass and Mr. McEntee—and the Lord Mayor were present.

Last week a "Dragon" came in after dark from Heston via Liverpool with six shooting guests for the Hon. A. E. Guinness. It was a B.A.N.C.O. machine piloted by Mr. Flowerday, who was once in a fighter squadron with Mr. French, the chief instructor.

NORFOLK AND NORWICH

Despite the poor weather last week the flying hours on the whole were good. Early in the week Mr. J. Collier made another photographic flight over Great Yarmouth, and obtained for the Press a number of air pictures of the herring fleet.

On Armistice Day the club did not commence flying until lunch time, and in the afternoon many members of the Comrades of the R.A.F. were entertained at the club by their chairman, Sq. Ldr. C. A. Rea, and other members. All were given flights by club members. After tea Sq. Ldr. Rea welcomed the guests.

CINQUE PORTS FLYING

Owing partly to the bad weather, and to the fact that one of the machines is having its "C. of A.," the flying times amounted to only 31 hours. Two new flying members joined.

On November 16 the club is giving a dinner and dance at the Grand Hotel, Dover, in honour of Messrs. Ken Waller, Cathcart Jones and Bernard Rubin. It is hoped that all members will turn up to support the club on this occasion.

The annual general meeting of the club was held last week, and a new committee was elected, consisting of Capt. L. A. R. Braddell, Dr. W. Daggett and Messrs. R. Butler, N. C. Butler, Clayton Rickard, E. A. H. Peat and H. Twaites. Since Mr. Leslie Cliff is now permanently on the staff, another "Gipsy I Moth" is to be purchased. Plans are going ahead for the extension of the club buildings, and the designs look promising, with big extensions to the lounge, bar and workshops.

LIVERPOOL

In spite of a distinct deterioration in the weather towards the end of the week, a total of 45 hr. 35 min. was flown by the Liverpool Club at Hooton Park and Speke.

CARDIFF

Two new flying members have joined the Cardiff Aeroplane Club, and there were three first soloists last week, during which only 8 hr. 10 min. dual and solo flying was done.

CAMBRIDGE

Flying hours at Marshall's School last week totalled 13 hr. 50 min. dual and 9 hr. 15 min. solo. The drop was due to the bad weather conditions which prevailed, and not to any lack of enthusiasm. During the week Mr. Whitney Straight visited the aerodrome in the Monospar which won this year's King's Cup race.

HERTS AND ESSEX

Bad weather, with continuous rain, has seriously handicapped flying at Broxbourne during the past week.

The snooker match played on November 8 against the Eastwood Club was a success, and a return match will be held at Goodmayes on November 28.

The club dinner and dance will be held this year at the Park Lane Hotel on December 18. It is hoped that the club's joint presidents, Mr. and Mrs. Mollison, will preside. Application for tickets should be made to the secretary as soon as possible.

GAIETY AT GRAVESEND

Those who picture the people at Gravesend Airport as being wholly engaged in watching the weather, guiding air liners to a safe "harbourage," training future pilots and repairing damaged machines would have been pleasantly surprised at the delightfully informal and cheery dance held at the clubhouse on Guy Fawkes Night.

The decorations, which were designed by the resident staff in their spare time, were strikingly original and caused a lot of amusement amongst the fifty-odd Gravesend Aerodrome Club members and guests who were present. Dance music of a high standard was provided by Frank Storey's Orchestra, which was specially brought down from London for the occasion.

BROOKLANDS

On Saturday, November 3, a firework display was held for the children of the employees of Brooklands, followed by the first dance of the season at the club. The latter was very well attended, the clubhouse being filled to capacity, and the evening ended with the usual bacon and eggs in the small hours.

On Sunday morning five private owners flew to Bournemouth for lunch, but, on the return journey, they were all forced to land at various stages on the way home owing to the very bad weather. One and all landed successfully, and the machines have all returned during the week. Capt. W. S. Mackenzie has returned from his visit to the southern hemisphere.

Flying times for last week were 32.20 hr. dual and 19.35 hr. solo, making a total of 51.55 hr. Mr. Kenyon passed his "A" licence tests.

HATFIELD

The flying time at the London Aeroplane Club for last week amounted to 37 hr. 10 min. Miss Blackwell completed her "A" licence tests, and two members made first solos.

The annual dinner and dance is to be held on Friday, December 14, at the Park Lane Hotel. During the evening Lt.-Col. F. C. Shelmerdine, C.I.E., O.B.E., the Director of Civil Aviation, has very kindly consented to present the club challenge cups won by members in the various club competitions held throughout the year. Tickets may be obtained from the Dance Secretary, London Aeroplane Club, or from the Royal Aero Club. The car badges have now arrived, and are available for members.

The activities of the R.A.F. Flying Club have been slowly but surely increasing. During the latter part of the summer three machines have been in fairly continual use.

Special provision has now been made for admitting serving officers of the R.A.F. to membership, and also for officers of the Dominions air services visiting from overseas, which enables them to take out a short-term membership, and thus avail themselves of the club's facilities whilst in this country.

BRITISH AERO ENGINES

A Review of Modern Types

Brilliant performance, obtained without sacrifice of durability, characterises the latest British aero engines. Originality is expressed both in basic design and constructional details. Successful sleeve-valve and compression-ignition engines have been developed, and air-cooled types with unorthodox cylinder arrangements are going into production. As a result of the introduction of leaded fuel of high octane value the outputs of certain engines for military purposes have been greatly increased.

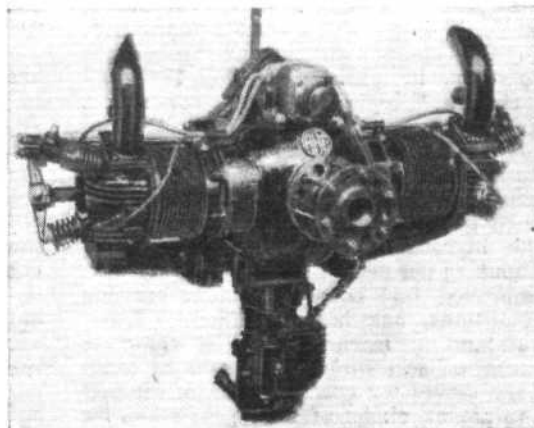
The following notes deal briefly with the most recent ranges offered by each company. The relative outputs, sizes and weights of the various engines are indicated in the table on page 1223.

A.B.C. MOTORS, LTD.

AS long ago as 1911 the A.B.C. Company produced its first aero engines. The company later pioneered the development of high-powered air-cooled radials and produced, during the War, the "Wasp" and "Dragonfly" engines. After the War, when the light aeroplane movement began to make itself felt, the "Scorpion" (34 h.p.) and "Hornet" (75 h.p.) light air-cooled horizontally-opposed engines were built, and were the last types the company put on the market.

The "Scorpion" is a two-cylinder model in which the cylinder heads are of cast iron and are bolted direct to the cylinder barrels. Two valves, operated through push rods, are fitted to each

cylinder. The induction manifold is cast integrally with the lower half of the crank case, thus utilising the heat of the oil to warm the mixture and, at the same time, cooling the oil. Measuring over the valve gear, the "Scorpion" is only 32½ inches wide and the length is 15½ inches. The weight is 109 lb. Fuel consumption is given as .52 pint per b.h.p. hour. The "Hornet" is virtually a "tandem" version of the "Scorpion," the cylinders of the two engines being interchangeable. Its normal output is 34 b.h.p. at 2,300 r.p.m., and it weighs, complete, 245 lb.



The A.B.C. "Scorpion" is rated at 34 h.p. and weighs 109 lb.

ARMSTRONG-SIDDELEY MOTORS, LTD.

AN extremely wide range of engines is offered by this company and provides power plants suitable for aircraft intended for any conceivable purpose, military, training, commercial or private. Nearly fifty countries are using Siddeley engines under widely varying conditions, and have obtained regular periods of 500 hours between overhauls, and, in the

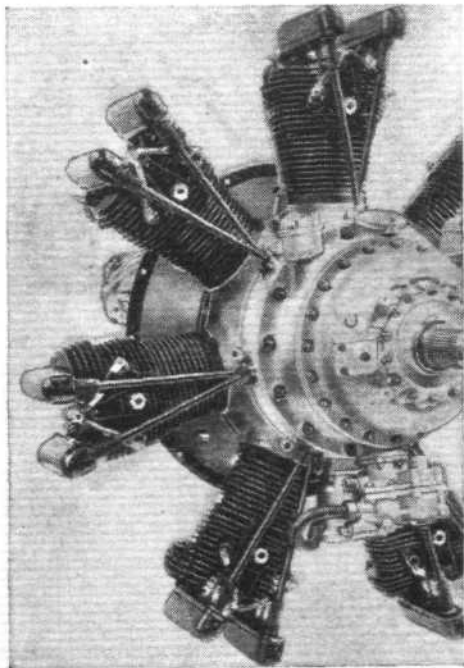
case of certain types, even 600 hours. Siddeley engines will operate perfectly under the conditions imposed by the use of long chord, low drag cowlings, and "Lynx" and "Jaguar" engines have used leaded fuel in Canada for the past six years.

Smallest of the Siddeley types is the "Genet," of 80 h.p., and the largest is the fourteen cylinder "Leopard," of ten times that power—the most powerful radial engine manufactured in this country. Intermediate types include the "Genet Major" with either five or seven cylinders (107 h.p. or 140 h.p.), "Mongoose" (150 h.p.), "Lynx" (215 h.p.), "Cheetah" (270 h.p. and 290 h.p.), "Serval" (340 h.p.), "Jaguar" (400 h.p. and 460 h.p.), "Panther" (540 h.p. and 560 h.p.), and "Tiger" (610 h.p. and 700 h.p.). Many parts are interchangeable between various engines.

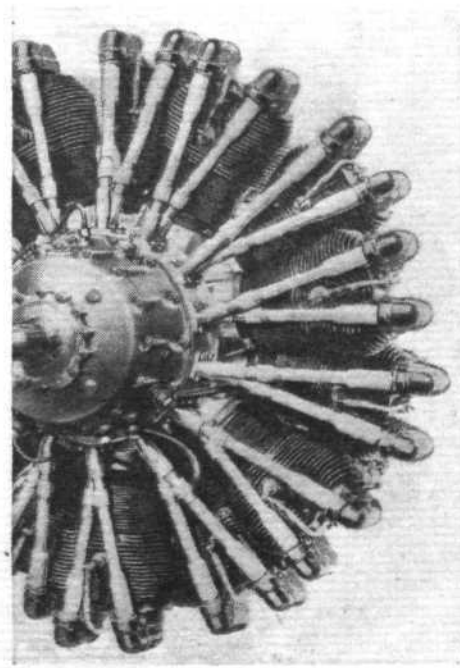
Typical of the double-row types is the "Panther," which is available as a geared fan or fully supercharged type. The body of the engine is composed of the crank case, accommodating the cylinders, crankshaft, master and auxiliary rods and pistons. The timing gear is enclosed in front by an intermediate bearing housing carrying the oil pumps, and in front of this is fitted, as an easily detachable unit, the reduction gearing. To the rear the crank case is sealed by the diaphragm plate, and the space enclosed by this latter and the front face of the induction casing accommodates the gear for operating the auxiliary drive for the supercharger or geared fan. Either a hand, combined hand and electric, or inertia starter may be provided, and two gun gear generators and an auxiliary

drive box embodying a gas starter, fuel pumps and tachometer drive are also accommodated.

The "Lynx" is, perhaps, the most widely known of the Siddeley single-row types, and is exceptionally popular for military and civil training, and for installation in several types of private and commercial machines, including such high-speed aircraft as the Airspeed "Courier." This engine is also the standard power plant in Royal Air Force training machines. Unquestionable reli-



The geared Siddeley "Lynx" is rated at 215 h.p. and weighs 610 lb.



For use in fighting aircraft, the "Panther" VII gives 540 h.p. at 12,000 ft.

ability and economical cost of operation are two of its best recommendations. It is a seven-cylinder single-row radial available in direct drive, geared and/or supercharged forms. The seven cylinders are arranged round a barrel-type crank case which supports a one-piece balanced

crankshaft, the connecting-rod assembly being of the split master rod and plain auxiliary rod type. Cylinders are interchangeable with those fitted to the "Jaguar," with steel barrels machined from forgings screwed into aluminium alloy heads.

THE BRISTOL AEROPLANE COMPANY, LTD.

NINE-CYLINDER radial engines have for long been the speciality of the Bristol Company. The company's name was made famous by the "Jupiter" engine. This type was succeeded by the "Pegasus" which, like its forerunner, is enjoying widespread popularity. In the company's current programme there is, in addition to the Series II "Pegasus" types, a new range of engines known as the "Mercury" VI, "Pegasus" III and "Pegasus" IV, which will be in full production in 1935. The marked increase in performance obtained with these engines is due to the use of the high-octane fuel. An increase of about 15 per cent. in power output, with improved fuel economy under cruising conditions, has been obtained. Other outstanding features are the complete range of accessories, provision of auxiliary drives for special items of aircraft equipment, choice of three gear ratios for each engine, and the standardisation of controllable pitch airscrews.

On the cylinders, the barrels of which are of hardened alloy steel, ample cooling area has been provided to ensure a generous margin of cooling for the conditions imposed by high power output in low-drag cowlings. Sodium cooled exhaust valves have been standardised. The crankshaft and connecting rod assembly have been re-designed to cope with the higher engine speeds and improved materials have been used. In its new form the crankshaft is surface hardened all over, and, as a result of the exceptionally hard bearing surface

provided by this treatment, together with the higher fatigue range afforded by the new material, the life of this durable component is further prolonged. Full skirted forged pistons have also been standardised. The introduction of surface-hardened cylinder barrels and modifications to the piston ring design ensure that oil consumption is maintained at a low level despite the increased speeds of rotation of the engines. The carburettors incorporate a delayed-action pump permitting positive and rapid acceleration to be obtained with economical tuning for cruising, and a slow running cut-out to prevent a hot engine continuing to "slow run" after switching off. A boost control of the automatic servo type is employed.

Although the standard reduction gear ratio for all engines is 0.5, the "Mercury" VI may have .666 or .572 ratios, and the "Pegasus" III and IV may have .572 or .444 ratios if desired. Provision is made for fitting Hamilton V.P. air-screws.

The 605 h.p. "Mercury" VI-S is the smallest engine of the new series, being intended for use in high-speed fighting aircraft. Normal pressure is maintained in the induction system up to 15,500 ft. Exceptionally high power for take off and climb is offered by "Pegasus" III. The maximum power is 775 h.p. The "Pegasus" IV, which is supercharged up to 15,000 ft., gives 710 h.p. at that height.

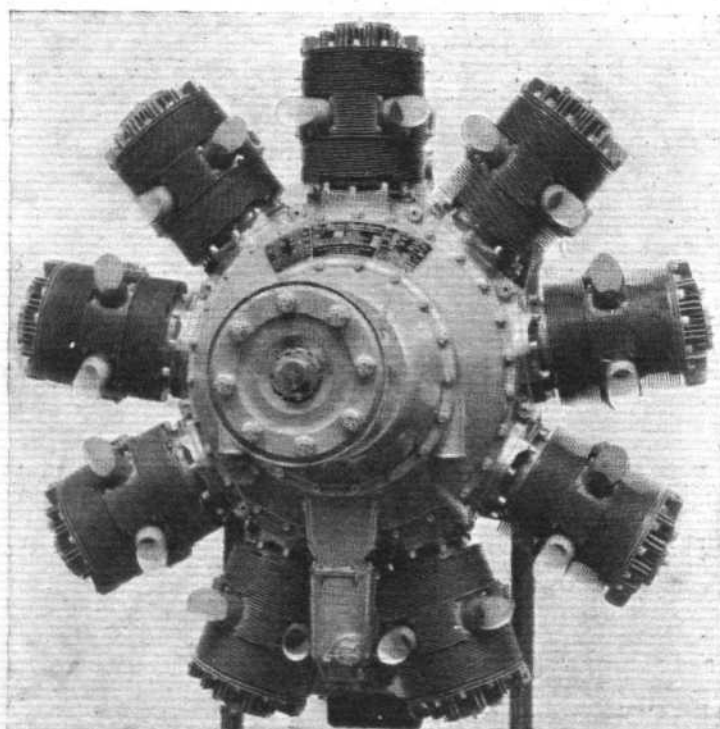
Lately the company has produced a very successful compression ignition



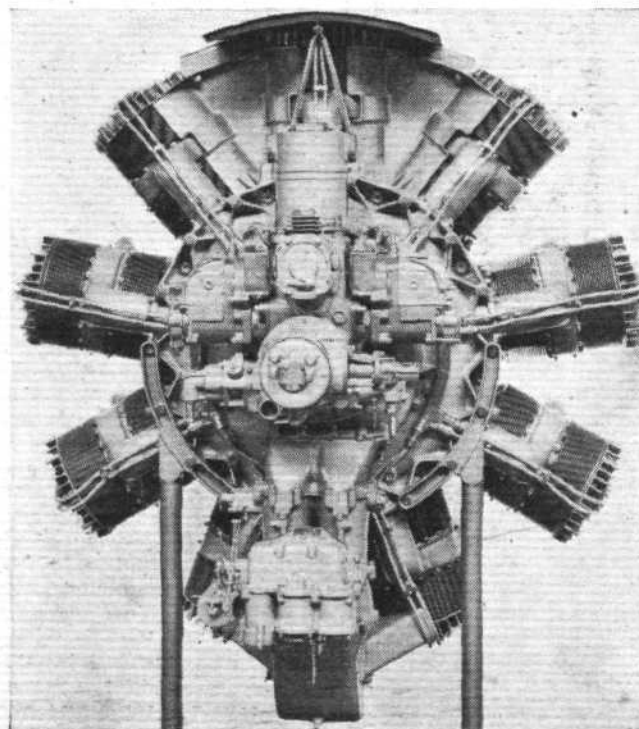
A sectioned view of the Bristol "Pegasus" 9-cyl. radial of some 600 h.p.

engine—the "Phoenix" and the "Aquila" and "Perseus" sleeve-valve types. These engines are of 15.6 litres and 24.8 litres capacity respectively, and are intended for civil use, although military versions are being developed. Hamilton V.P. airscrews may be used. The chief advantages of the sleeve-valve engine are ease of manufacture and maintenance, low fuel consumption, and the ability to run at high compression ratios with any fuel of given octane number.

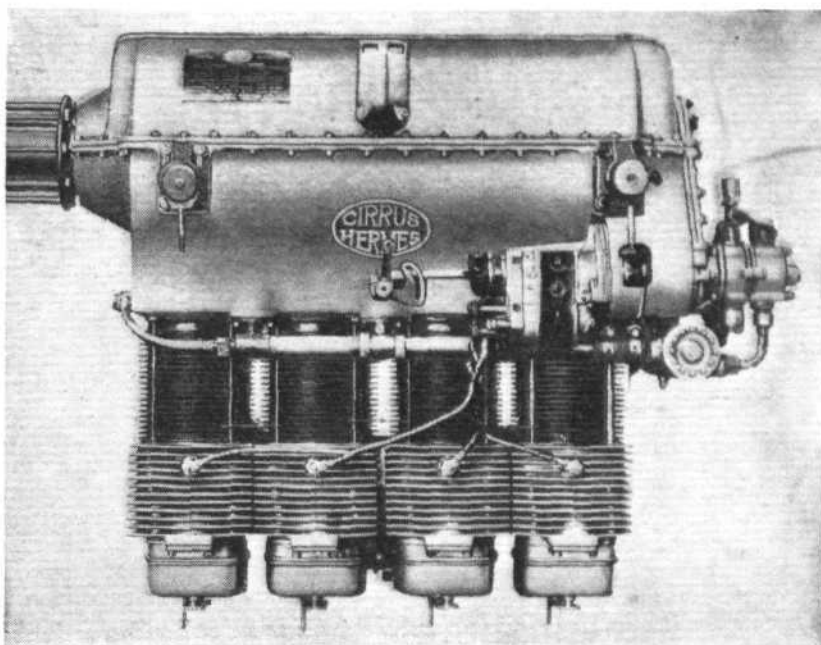
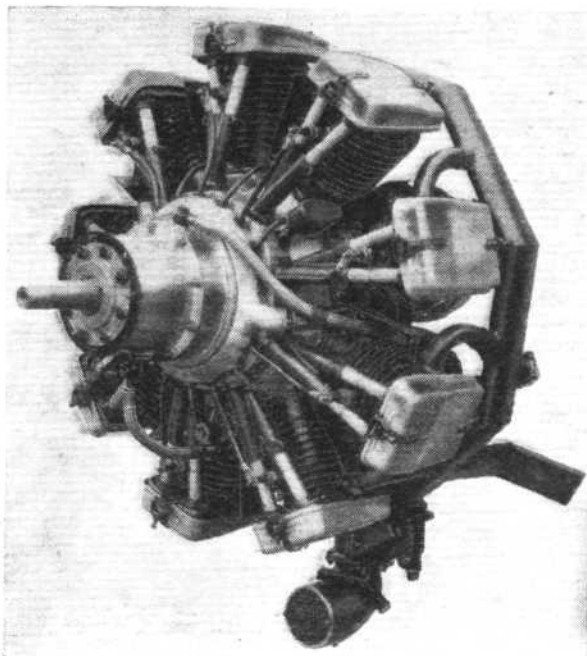
Although the manufacturers have every confidence in the great possibilities of these sleeve-valve engines, it is only in accordance with their usual policy that they require development to be complete before putting them on the market.



The Bristol "Aquila" sleeve valve engine is a smaller version of the "Perseus" shown on the right.



A rear view of the Bristol "Perseus" sleeve valve radial, which is rated at 520 h.p.



(Left) the Salmson A.D.9R. Series II, of 70 h.p. with the new enclosed valve gear, and (right) the Cirrus-Hermes IV of 120 h.p.

BRITISH SALMSON AERO ENGINES, LTD.

FORMED to construct Salmson engines in England, this company's most recent product is the A.D.9R type nine-cylinder radial rated at 70 h.p. Lately this engine has been produced with re-designed valve gear totally enclosed in oilproof boxes. This latter version is known as the A.D.9R Series II. Its general specification is similar to that of the A.D.9R, which is a single-row radial with a single-throw crankshaft on roller bearings. Overhead valves, operated

through push-rods and tappets, the latter riding on the cam tracts driven through eccentric epicyclic gears, are utilised. One inlet and one exhaust valve to each cylinder are provided. Eight auxiliary rods are articulated to a master rod with a solid white metal bearing.

The Claudel Hobson carburettor is fitted at the rear of the engine with a specially arranged induction system, and dual ignition is provided by two nine-cylinder H.T. magnetos. The airscrew is

driven through a 2:1 reduction gear. The whole reduction gear is a unit by itself and may be withdrawn complete without disturbing any other part of the engine. Lubrication is on the dry sump principle with several special features. The engine is started either by hand from the rear or by hand-started magnetos. At cruising speed fuel consumption is from 4 to 4½ gallons per hour, and oil consumption from 1.6 to 1.7 pints per hour.

CIRRUS-HERMES ENGINEERING CO., LTD.

THE improved Cirrus-Hermes Mark IV A of 120 h.p. and the 70 h.p. "Cirrus-Minor" are two of the latest products of this company. The Hermes IV A is a four-cylinder inverted air-cooled type weighing 300 lb. and delivering a maximum power of 135 h.p. at 2,300 r.p.m. At cruising speed the engine consumes approximately 7 gallons of fuel per hour. Cylinders are of centrifugally cast iron, with detachable aluminium heads, and the pistons are aluminium alloy castings. The connecting-rods are steel stampings

with big-end bearings carried in steel shells. The "Cirrus-Minor" is quite a new type, giving a maximum of 80 h.p. at 2,400 r.p.m. The weight is approximately 210 lb. Cylinder heads are attached to the cylinders by flanges and a spigot, and the usual long holding-down stud is absent. Pistons are of the slipper type, with connecting-rods of Hiduminium with steel-backed white-metal bearings. The crank case is a very neat casting with all the oilways carried internally. Housed in the crank

case are two vertical magneto drives from the crankshaft with spiral gears, the magnetos being of the spigoted type, with distributor pointing downwards. The breather is contained in the crank case cover at the rear of the engine. Provision is made, in this engine, for an electric starter.

It is known that this company has certain new types of aero engine at present under construction. Particulars of these, however, are not yet available for publication.

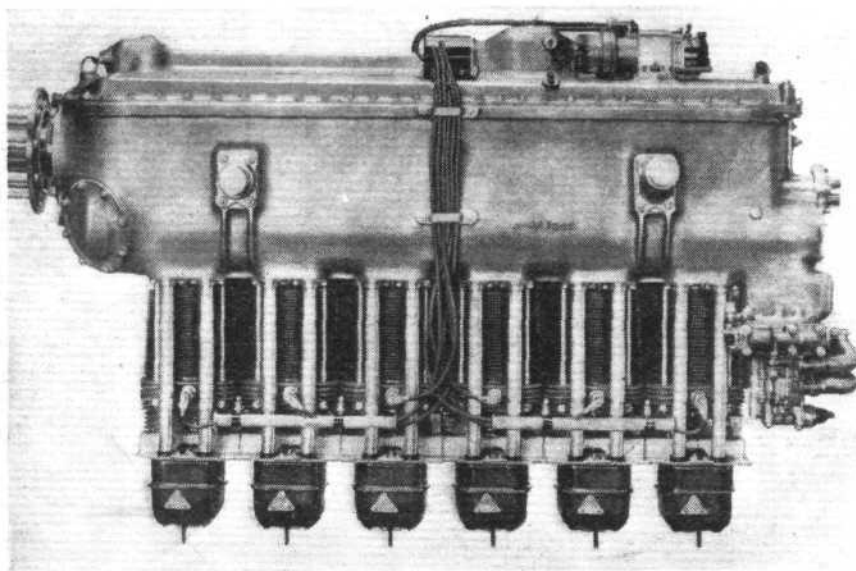
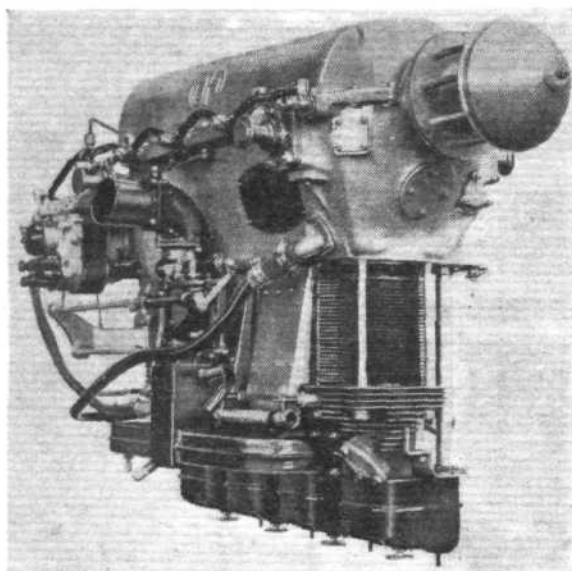
THE DE HAVILLAND AIRCRAFT CO., LTD.

IT is probable that the "Gipsy" types, manufactured by this company, have broken more records than any other series of engines. There are five "Gipsy" types, the "Gipsy I" (100 h.p.), "Gipsy II" (120 h.p.), "Gipsy III" (120 h.p.), "Gipsy Major" (130 h.p.), and "Gipsy Six" (200 h.p.). The last three types are inverted engines, and the company is concentrating on the production of the "Gipsy Major" and "Gipsy Six." The "Gipsy Major" is a four-cylinder-in-line inverted air-cooled

type using cylinders machined from forged carbon steel billets, and cylinder heads of aluminium bronze with the valve seats formed integral with the cylinder heads. Pistons are of the slipper type, cast from aluminium alloy, and the crankshaft is machined from a single forging and carried on five plain bearings in a crank case also of aluminium alloy. At full throttle (2,350 r.p.m.) the fuel consumption is 9.75 gallons per hour and oil consumption 1.25 pints per hour. "Gipsy" engines have six times

been flown across the Atlantic, being the only light aero engines to have done so.

Virtually a six-cylinder version of the "Gipsy Major," the "Gipsy Six" is a more recent type, but has already distinguished itself in service when fitted in such aircraft as the "Dragon Six," and the four-engined D.H.89. In spite of 50 per cent. power increase the frontal area is no greater than that of the "Gipsy Major," and the overall length is very little more than in the case of the four-cylinder type. The balance and



(Left) the 4-cyl. D.H. "Gipsy Major" of 120 h.p., and (right) the 200 h.p. "Gipsy Six."

smooth running of the engine reduce to a minimum the reactionary torque on both engine mounting and aircraft structure. The equipment of the "Gipsy Six" is very complete, and includes electric starter, duplex fuel pumps, twin carburettors, provision for driving an electric dynamo and alternative types of engine feet to suit the mounting in which the engine is to be installed. Such items

as cylinders, cylinder heads, connecting-rods, valves and valve gear are interchangeable with corresponding parts on the "Gipsy Major."

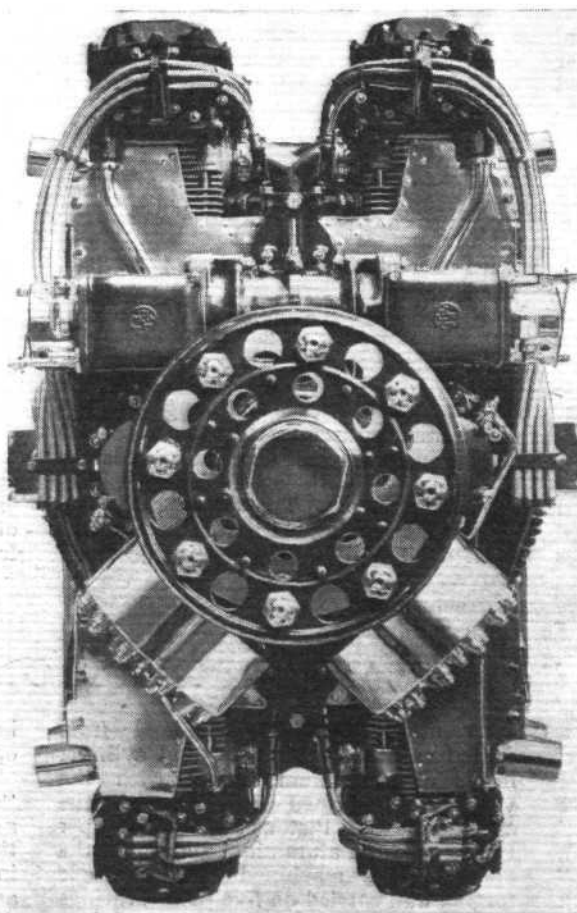
Special high-compression racing versions of the "Gipsy Six" were installed in the D.H. "Comet" monoplane which won the speed prize in the MacRobertson England-Australia Race, and in a similar machine which flew to Australia and

back to England in less than a fortnight. In these engines modified pistons and cylinder heads were used, and the normal speed of rotation increased to 2,350 r.p.m. In this form the engine develops, on the bench, a maximum output of 224 h.p. at 2,400 r.p.m. at sea level. Flying at 10,000 ft. it gives, at full throttle, 160 h.p. at 2,250 r.p.m., the fuel consumption being 0.48 lb.b.h.p.-hr.

D. NAPIER & SON, LTD.

ORIGINALITY is perhaps, the most striking feature of recent Napier designs. This company built up an enviable reputation for its "Lion" water-cooled "broad arrow" engines, and in introducing its air-cooled series is keeping abreast of, if not ahead of, the times. In addition, the company holds the licence to build Junkers-designed compression-ignition aero engines.

Three air-cooled types have lately been produced by the company—the six-cylinder "Javelin," 16-cylinder "Rapier," and 24-cylinder "Dagger." The former is an inverted "in line" type giving a normal power of 160 h.p. at 2,100 r.p.m., and weighing 425 lb. The sixteen cylinders of the "Rapier" are arranged in four banks of four in the form of an "H." The Series II is supercharged to deliver 305 h.p. at 3,500 r.p.m. at 10,000 ft., and the Series IV gives 340 h.p. at sea level. It is claimed that the "Rapier" presents less than half the frontal area of any air-cooled engine of comparable power. Latest and largest of the air-cooled series is the "Dagger" which, in its present form, gives a normal output of 630 h.p. at 3,500 r.p.m. at 10,000 ft., using fuel containing no T.E.L. The engine passed the Air Ministry 100 Hours Type Test several months ago, and installed in a Hawker "Hart" two-seater biplane put up quite an astounding performance at this year's S.B.A.C. display. Complete particulars

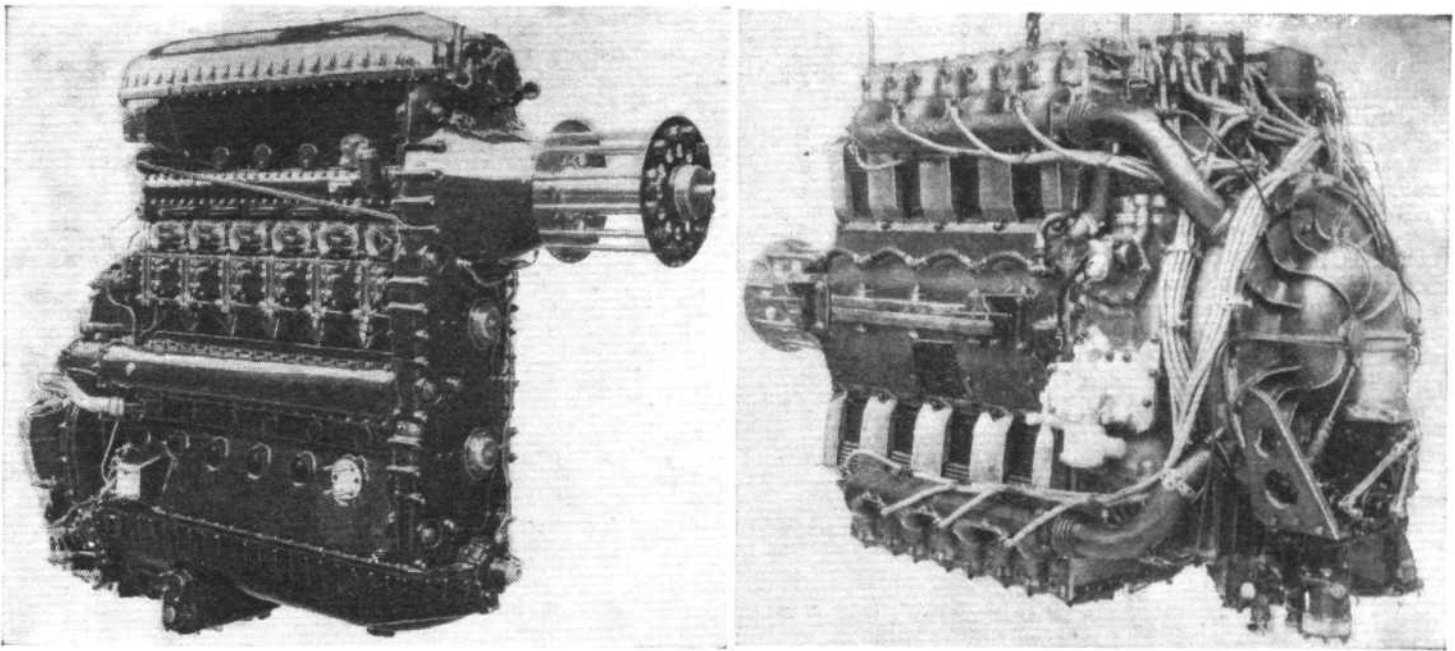


Showing the amazingly small frontal area of the Napier "Dagger" 630 h.p. engine.

are not yet available for publication, but it may be said that two 24-cylinder mag-

netos are arranged at the front end of the engine with the distributors separate from the generators. A down-draught carburettor is fitted above the supercharger casing at the rear end of the engine. The rated boost is + 1½ lb./sq. in., the maximum boost + 3 lb./sq. in., and the "maximum power" altitude 12,000 ft.

The Napier - Junkers "Culverin" is a two-stroke compression-ignition engine having two opposed pistons in each of its six vertical cylinders. Two crankshafts are used and are carried in lead-bronze bearings. The connecting-rod big-ends are also fitted with lead-bronze bearings. The engine body is a single casting of "Hiduminium" alloy, with steel liners. Inlet and exhaust ports are provided in each cylinder, the inlet ports being controlled by the lower piston and the exhaust by the upper piston. Fuel is supplied to each cylinder through four nozzles by two fuel injection pumps operated by camshafts running at engine speed. These injection pumps are supplied with fuel by two gear-wheel type pumps running at engine speed and fitted at the rear of each camshaft housing. Lubrication is on the pressure-feed system from a gear-wheel type pump fitted at the rear of the engine. Scavenge air is supplied by an air pump. Drives are incorporated for generator, low-pressure compressor, high-pressure compressor and tachometer. The nett dry weight



The Napier-Junkers "Culverin" 6-cyl. compression-ignition engine of 720 h.p., and (right) the supercharged "Rapier" II, which delivers 305 h.p. at 10,000 ft.

of the engine without airscrew hub is approximately 1,785 lb., and the airscrew hub weighs 35 lb. On rated power (720 b.h.p. at 1,700 r.p.m.) the engine weighs 2.48 lb. per b.h.p. Overall length is 6 ft. 11 $\frac{3}{4}$ in., the width 1 ft. 11 in., and

the height 5 ft. 7 in. Fuel consumption is given as 0.375 lb./b.h.p./hr. at rated power and lubricating oil consumption as 0.023 lb./b.h.p./hr. The British Air Ministry has interested itself in the "Culverin," particularly with regard to

its possibilities of installation in long-range aircraft such as bombers and flying boats. A smaller compression-ignition type known as the "Cutlass" has also been produced by the company, but particulars are not available.

POBJOY AIRMOTORS, LTD.

SMOOTH and quiet running qualities combined with cleanliness and economy of operation and lightness are characteristic qualities of Pobjoy engines. Three types are now in production, all developments of the Pobjoy "R" engine which was produced three or four years ago. These types are all 7-cylinder radials, and are known as the "Niagara," "Cataract," and "Cascade." The former two are geared, and the "Cascade" is a direct drive type. Normal powers are 84 h.p. at 3,200 r.p.m., 75 h.p. at 2,900 r.p.m., and 65 h.p. at 2,600 r.p.m. respectively. All three engines have the same bore and stroke.

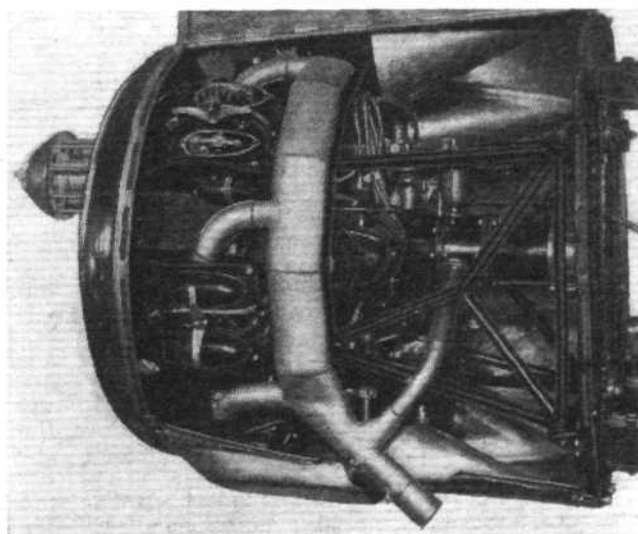
The crankcase of the "Niagara" engine is in four parts, and carries a single throw, two-piece crankshaft on four substantial bearings. The single crankpin is hardened, and on it runs a floating bronze bush running inside the hardened eye integral with the nickel chrome steel master rod, to which are linked the six articulated connecting rods. The die-cast aluminium cylinder heads are screwed to the steel barrels and locked by a patented method. Oil-tight cast aluminium casings completely enclose the valve gear. Each cylinder head carries one inlet and one exhaust valve, the clearance of which need not be readjusted more frequently than every 125 hours.

Double helical reduction gearing is employed, and includes a shock absorber to eliminate "chattering" at low speed.

The two independent ignition systems each consist of a B.T.H. magneto, firing its respective sparking plug in each cylinder via a separate H.T. distributor. Shielded ignition can be provided for use with radio. The hand starting mechanism, of the ratchet type, is completely disengaged when in the normal running position. The Claudel Hobson carburettor is oil-jacketed to prevent freezing, and a controllable hot and cold air intake is fitted. Cowling is supplied as an integral part of the engine. All the air entering the cowling ring is forced to circulate over the cylinder heads or around the barrels by deflectors and helmets. Exhaust collectors are situated inside the

outer bonnet. Complete accessibility to such items as plugs, valve gear, magnetos and petrol pump can be had by raising this bonnet. To remove any possibility of fire risk, a sheet-aluminium guard is provided which surrounds completely the rear of the engine and shields it from the exhaust pipes. In a serious crash the exhaust pipes would be trapped between two layers of cold aluminium, thereby eliminating one of the main causes of fire after a crash. The exhaust collectors are specially designed to avoid expansion troubles. They are reinforced at all corners with internal fillets and are protected against corrosion by a process known as "aluminization." An

adaptor is fitted as standard in the induction manifold for use, if required, with a priming pump. This is of assistance for cold-weather starting from the cabins of multi-engined machines or flying boats. On the starboard side of the rear cover a sealed type of "Veeder" indicator is fitted, which records the number of hours run up to 1,000. The new valve rocker gear is so made that inspection is desirable only every 125 hours. It has been found that, owing to the cool running of the engine, valve rockers require no attention. Top overhaul is necessary only every 250 hours. It is claimed that the noise per horse-power is less than half that of any other engine due to the slow speed airscrew, smooth exhaust flow and absence of vibration.

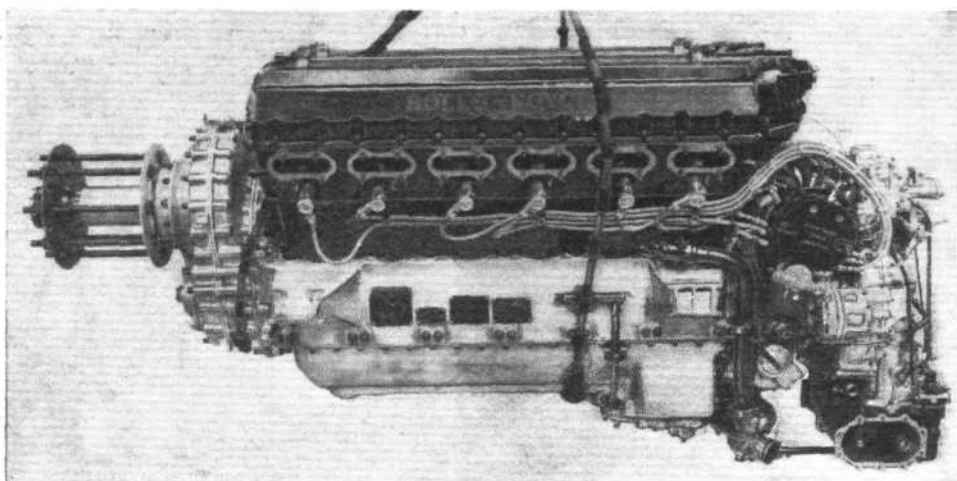


The neat cowling and exhaust system of the Pobjoy "Niagara" 84 h.p. radial.

ROLLS-ROYCE, LTD.

KNOwn as the "Kestrel" VI, "Goshawk," and "Buzzard" series, the latest productions of the Rolls-Royce Company are 12-cylinder "V" type liquid-cooled engines. The new "Kestrel" engines differ from former "Kestrel" types (Series I, II, and III) in that they are fitted with a strengthened reduction gear and an improved supercharger, and that they run at higher speeds on fuel of high octane value. These engines have been tested to run compositely cooled, and provision is made in their design for hand or gas starting, and drives for dynamo and an air compressor. The "Kestrel" V supercharged engine has recently been adopted by the Royal Air Force as a standard type to supplement the "Kestrels" of earlier pattern already in use in very large numbers. "Kestrels" and "Goshawks" of the latest types are fitted to numerous prototype aircraft now being built and tested for possible adoption by the British Air Ministry. The "Goshawk" is generally similar to the "Kestrel" and is designed to be evaporatively cooled.

The new "Kestrels" are available in nine types, all incorporating the same main components. These nine types are obtained by giving each of the normally aspirated, moderately supercharged and fully supercharged engines three alternative reduction gear ratios, 0.632, 0.553 and 0.477. The "Kestrel" IV, V and VI are fully supercharged engines maintaining 600 h.p. at 11,000 ft. on climb and giving a maximum power of 640 h.p. in level flight at 14,000 ft. "Kestrels" of the Series VII, VIII and IX are moderately supercharged engines maintaining 630 h.p. at 3,000 ft. on climb,

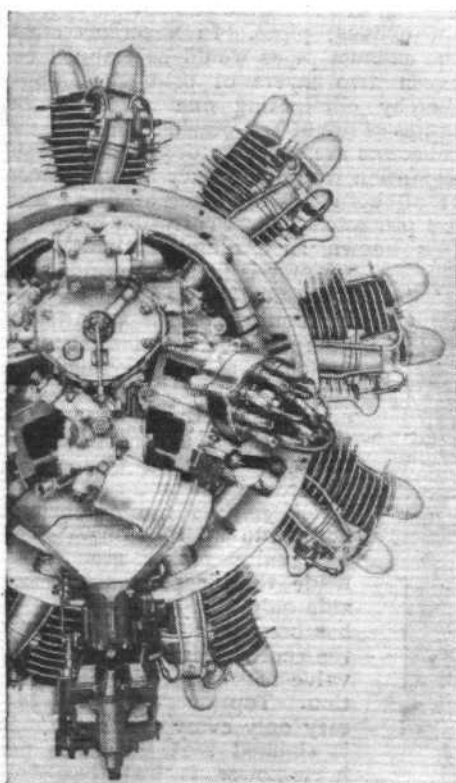


Supercharged to give 600 h.p. at 11,000 ft. the Rolls-Royce "Kestrel" VI is compositely cooled.

and giving a maximum of 680 h.p. in level flight at 5,250 ft. "Kestrels" X, XI and XII are normally aspirated types giving 575 h.p. for a climbing take-off and 622 h.p. in level flight at sea level. Supercharged "Kestrels" have a compression ratio of 6:1, and the unsupercharged types have 7:1 compression. The former are intended for use in aircraft having an operational altitude of approximately 15,000 ft., and the latter are recommended for machines where fuel economy and range are of paramount importance. Moderately supercharged units are suited for machines having an operational height of not more than 5,000 ft., such as flying boats and seaplanes. The composite cooling system offers less resistance by reducing radiator drag. Radiator size is fixed by the speed and power in level flight and not on climb, as previously. Any steam formed on climb due to the smaller radiator is diverted to a condenser, whence it is led back into the water system. This means that on climb the engine is part water and part steam cooled, hence the term "composite cooling."

In the "Kestrel" the two banks of six cylinders are cast in "monobloc" form. Pistons are machined from "Y"

alloy forgings. The crankshaft is of the six-throw type, of nickel-chrome steel, one forked and one plain connecting-rod being carried on each crank pin. Two castings of aluminium alloy are used for the crank case, these being joined on a plane slightly below the crankshaft. Plain spur reduction gears are fitted. The "Buzzard" engine is larger than, but similar to the "Kestrel," and is provided with a supercharger for high take-off performance, such as is required in heavily loaded land or water aircraft or multi-engined machines. Reduction gear ratios similar to those for the "Kestrel" are obtainable, and the compression ratio is 5.5:1. The "Buzzard" is a standard power plant in the Royal Air Force. The "R" type racing engine was a development of the "Buzzard." This engine was fitted in the Supermarine S6B which won the Schneider Trophy for Great Britain in 1931, and to a similar aircraft which established a world's speed record of 407.5 m.p.h. during the same year. Running at 3,200 r.p.m., the engine gave 2,300 b.h.p. Its weight was 1,630 lb., so that a 21 per cent. power increase was obtained for a 6½ per cent. increase in weight. The specific weight was less than 0.71 lb./h.p.



Rated at 185 h.p., the Wolseley A.R.9. is a 9-cyl. radial weighing, in geared form, 452 lb.

WOLSELEY MOTORS (1927) LTD.

THE first aero engine constructed by the Wolseley Co., was flown as long ago as 1909. This was succeeded by engines of various powers and types, including air- and water-cooled in-line, radial air-cooled, and V-8 water-cooled examples. Perhaps the best known of these was the "Viper." The A.R.9 is the latest type to be marketed, and is supplied in two forms, either geared or as a direct drive engine. It is a nine-cylinder radial with steel forged cylinder barrels, screwed and shrunk into cast aluminium-alloy cylinder heads. Pistons are of forged "Y" alloy with two compression rings and a scraper ring. Inlet and exhaust valves, of which there are one each to each cylinder, are interchangeable. The chrome nickel steel master rod has a solid big-end with a floating bush of steel, white-metalled, inside and out. The crankshaft is of the single-throw two-piece type of chrome nickel steel, and the crank case is of the

barrel type, of aluminium alloy. Lubrication is on the dry sump system with a single scavenging and pressure pump unit of gear type driven at engine speed from the rear end of the crankshaft. Provision is made for a hand-turning gear with a ratio of 8.15:1, or an Eclipse inertia starter. The airscrew gearing, when provided, consists of a 17-tooth spur gear supported by a roller bearing carried by a stiff duralumin stamping attached to the crank case, and a hardened internal gear ring of 27 teeth attached to the airscrew shaft. Fuel consumption of the geared version is 11½ gallons per hour at 90 per cent. throttle, and that of the direct drive version is 12½ gallons per hour. A Town-end ring, which can be removed or refitted in a few minutes, can be supplied for the engine. Two A.R.9s are fitted to the new 170 m.p.h. Airspeed "Envoy" commercial monoplane now in production.

BRITISH AERO ENGINE TYPES

Data on Representative Models Produced by British Manufacturers

Maker and Type.	No. and Arrangement of Cyls.	Cooling.	Bore.	Stroke.	Compression Ratio.	Reduction Gear Ratio.	Normal Crankshaft R.P.M.	Rated Altitude.	Normal Output at Sea Level.	Normal Output at Rated Altitude.	Max. Output at Rated Altitude.	Dry Weight.	Remarks.
			mm.	mm.				ft.	B.H.P.	B.H.P.	B.H.P.	lb.	
A.B.C. : Scorpion ...	2 H.O.	A.	102	91.4	6	D.	2,300	S.L.	34	34	40	109	—
ARMSTRONG SIDDELEY : Genet ...	5 R.	A.	101.6	101.6	5.25	D.	2,200	S.L.	80	80	88	203	—
Genet Major (5-cyl.) ...	5 R.	A.	108	114.35	5.35	D.	2,200	S.L.	100	100	110	242	—
Genet Major (7-cyl.) ...	7 R.	A.	108	114.35	5	D.	2,200	S.L.	140	140	153	305	—
Mongoose III A ...	5 R.	A.	127	139.7	5	D.	1,850	S.L.	150	150	165	366	—
Lynx IV C ...	7 R.	A.	127	139.7	5	D.	1,900	S.L.	215	215	235	512	—
Lynx (G) ...	7 R.	A.	127	139.7	5	·657	2,000	S.L.	215	215	235	610	—
Lynx (S) ...	7 R.	A.	127	139.7	5	D.	1,900	11,500	182	200	218	540	Supercharged.
Cheetah V ...	7 R.	A.	133.3	139.7	5.2	D.	2,100	S.L.	270	270	302	592	—
Cheetah VI ...	7 R.	A.	133.3	139.7	5.2	D.	2,100	6,000	272	290	314	592	Moderately supercharged.
Serval III ...	10 R.	A.	127	139.7	5	D.	2,000	4,000	329	340	372	665	Moderately supercharged.
Serval IV ...	10 R.	A.	127	139.7	5	·657	2,000	S.L.	340	340	360	710	—
Jaguar ...	14 R.	A.	127	139.7	5	D.	1,700	S.L.	400	400	440	812	—
Jaguar VI D ...	14 R.	A.	127	139.7	5	·657	2,000	S.L.	460	460	490	910	—
Jaguar VII A ...	14 R.	A.	127	139.7	5	D.	2,000	14,500	370	400	457	910	Supercharged.
Panther VI ...	14 R.	A.	133.3	139.7	5.2	·657	2,100	5,500	530	560	625 at 6,700 ft.	980	Moderately supercharged.
Panther VII ...	14 R.	A.	133.3	139.7	5.2	·657	2,100	12,000	483	560	605 at 13,500 ft.	995	Supercharged.
Tiger III ...	14 R.	A.	139.7	152.4	5.35	·657	2,050	12,000	550	610	650 at 14,500 ft.	1,150	Supercharged.
Tiger IV ...	14 R.	A.	139.7	152.4	5.35	·594	2,150	5,000	651	700	749 at 6,000 ft.	1,150	Moderately supercharged.
Leopard III A ...	14 R.	A.	152.4	190.5	5	·633	1,700	1,500	800	800	854	1,637	—
BRISTOL : Mercury VI-S ...	9 R.	A.	146.9	166	—	·666 or 0.5	2,400	12,500	620	605	645 at 15,000 ft.	975	Supercharged.
Pegasus U ...	9 R.	A.	146.9	191	—	·666 or 0.5	1,900	G.L.	550	550	610	970	" Commercial " engine.
Pegasus II-L ...	9 R.	A.	146.9	191	—	·666 or 0.5	2,000	2,000	635	600	650 at 2,500 ft.	1,000	" Low duty " supercharger.
Pegasus II-M ...	9 R.	A.	146.9	191	—	·666 or 0.5	2,000	5,000	620	580	635 at 6,500 ft.	1,000	Moderately supercharged.
Pegasus III ...	9 R.	A.	146.9	191	—	·666 or 0.5	2,200	3,500	775	690	750 at 4,750 ft.	1,010	Moderately supercharged.
Pegasus IV ...	9 R.	A.	146.9	191	—	·666 or 0.5	2,250	11,500	680	660	720	1,010	Supercharged.
Phoenix ...	9 R.	A.	146.9	191	—	·655	—	—	470	415	430	1,090	Compression ignition engine.
Perseus I ...	9 R.	A.	146.9	166	—	·655	2,000	2,500	515	520	580 at 3,000 ft.	—	Sleeve valve engine.
BRITISH SALMON : A.D.9.R ...	9 R.	A.	70	86	6	0.5	3,000	S.L.	70	70	76	176	A.D.9.R Series II has new type valve gear.
A.C.7 ...	7 R.	A.	100	130	5	D.	1,800	S.L.	105	105	—	286	—
CIRRUS-HERMES : Hermes II B ...	4 L.	A.	114	140	5.1	D.	1,900	S.L.	105	105	115	305	—
Hermes IV ...	4 L.	A.	120	140	5.1	D.	2,000	S.L.	120	120	130	300	—
Hermes IV A (Imp.) ...	4 L.	A.	120	140	—	D.	2,000	S.L.	120	120	135	300	—
DE HAVILLAND : Gipsy II ...	4 L.	A.	114	140	5.2	D.	2,000	S.L.	110	110	120	298	—
Gipsy III ...	4 L.	A.	114	140	5.2	D.	2,000	S.L.	110	110	120	300	—
Gipsy Major ...	4 L.	A.	118	140	5.25	D.	2,100	S.L.	120	120	130	300	—
Gipsy Six ...	6 L.	A.	118	140	5.25	D.	2,100	S.L.	185	185	200	468	—
Gipsy Six (Racing) ...	6 L.	A.	118	140	6.5	D.	2,350	S.L.	—	—	224	542*	*With Ratier airscrew.
NAPIER : Lion XV ...	12 W.	W.	140	130	6	·53	2,350	S.L.	555	555	—	1,000	—
Javelin III ...	6 L.	A.	114	140	5.3	D.	2,100	S.L.	160	160	172	433	—
Rapier II ...	16 H.	A.	89	89	6	·39	3,500	10,000	—	305	355	720	Supercharged.
Rapier IV ...	16 H.	A.	89	89	6	·39	3,500	S.L.	340	340	385	—	—
Dagger ...	24 H.	A.	—	—	—	—	3,500	10,000	—	630	705 at 12,000 ft.	1,280	Supercharged.
Culverin ...	6 L.	W.	122	210	—	·693	1,700	S.L.	720	720	—	1,785	Compression ignition : Junkers licence.
POBJOY : Niagara ...	7 R.	A.	77	87	—	·47	3,200	S.L.	84	84	90	145	—
Cataract ...	7 R.	A.	77	87	—	·47	2,900	S.L.	75	75	80	135	—
Cascade ...	7 R.	A.	77	87	—	D.	2,600	S.L.	65	65	70	126	—
ROLLS-ROYCE : Kestrel IV, V and VI ...	12 V.	W.	127	140	6	See Note.	2,500	11,000	525	600	640 at 14,000 ft.	975	Supercharged. Gearing : Mk. IV, ·632 ; Mk. V, ·553 ; Mk. VI, ·477.
Kestrel VII, VIII and IX ...	12 V.	W.	127	140	6	See Note.	2,500	3,000	652	630	680 at 5,250 ft.	975	Mod. supercharged. Gearing : Mk. VII, ·632 ; Mk. VIII, ·533 ; Mk. IX, ·477.
Kestrel X, XI and XII ...	12 V.	W.	127	140	7	See Note.	2,500	S.L.	534	575	622	918	High compression. Gearing : Mk. X, ·632 ; Mk. XI, ·553 ; Mk. XII, ·477.
Buzzard I, II and III ...	12 V.	W.	152	167	—	See Note.	2,000	S.L.	845	825	955	1,540	Ground level supercharger. Gearing : Mk. I, ·632 ; Mk. II, ·533 ; Mk. III, ·477.
Goshawk I, II and III ...	12 V.	W.	127	140	—	See Note.	2,600	12,000	—	600	650 at 15,000 ft.	975	Supercharged. Gearing : Mk. I, ·632 ; Mk. II, ·533 ; Mk. III, ·477.
Goshawk VI, VII and VIII ...	12 V.	W.	127	140	—	See Note.	2,600	3,000	—	660	755	975	Mod. supercharged. Gearing : Mk. VI, ·632 ; Mk. VII, ·533 ; Mk. VIII, ·477.
" R " ...	12 V.	W.	152	167	5.5	—	—	—	—	—	2,300	1,630	Schneider Trophy racing engine.
WOLSELEY : A.R.9 Mk. I A ...	9 R.	A.	106	120	5.3	·629	2,200	S.L.	185	185	203	452	—
A.R.9 Mk. II A ...	9 R.	A.	106	120	5.3	D.	2,200	S.L.	180	180	198	372	—

A. = Air. W. = Water. D. = Direct Drive. R. = Radial. I. = Inverted. W. = " W " formation or " broad arrow." V. = " V " formation. L. = " In line." S.L. = Sea Level.

SPEED OF COMMERCIAL AEROPLANES

Important Considerations Raised by the Fact that Speeds of 200 m.p.h. at an Altitude of 13,000 ft. are now Possible : Points from a Lecture by M. Louis Breguet

FACTORS governing the speed of commercial aeroplanes formed the subject of a paper read recently by M. Louis Breguet before the Royal Aeronautical Society—the 581st lecture given before the R.Ae.S. since its foundation on January 12, 1866. M. Breguet is President of the Société Française de Navigation Aérienne.

The problem, said M. Breguet, of increasing the speed of commercial aeroplanes over a determined distance was subject to certain restrictions; for example, an upper limit was placed on the landing speed, while the ratio of paying load to the flying weight of the aeroplane when fully loaded should not fall below, say, 25 per cent. for distances of 300 miles, and about 10 per cent. for distances of 1,200 miles, when covered at high speeds.

Three principal means were designated as possible of use to increase the speed of a given type of aeroplane of minimum drag: (1) An increase in the engine power; (2) an increase in the wing loading by reduction of the surface of the wings; (3) an increase in the altitude of flight. These factors, if applied safely to the exclusion of the others, involve certain consequences, namely, an increase in power leads to a reduction in pay load; an increase in wing loading is limited by the minimum speed allowable for landing, and also in certain cases by the question of take-off, while an increase in altitude necessitates the provision of supercharging devices for the engine, an increase in structure weight, and a general reduction in the thermal efficiency of the engine, that is to say, an increase in specific consumption whereby the range is reduced. From this it is seen that it is advisable to use these three means together.

The problem would, therefore, seem to resolve itself into dealing with the braking of the aeroplane, both in the air and on the ground, and to the development of the power of engines at a high altitude. M. Breguet opined that we were to-day witnessing a new birth in the study of the processes of lift of flying machines, and that in a few years commercial aviation would be free for good from the restrictions which safety in landing still imposes on the loading of the wings.

Apart from reference to upper and lower surface flaps, slots, wheel brakes, reversible airscrews, and air brakes, he also said

he was convinced that in future airscrews which propel the aeroplane would be utilised for giving assistance at the moment of landing, and also for lifting and braking. Even now he thought that wing loading of from 20 to 30 lb. per sq. ft. could be contemplated for fast commercial aeroplanes equipped with suitable braking devices. He scouted entirely the view so often expressed that the greater the altitude the greater the speed, and, after discussing the drawbacks and advantages of superchargers, he concluded that the optimum altitude which could not profitably be exceeded for the fast aeroplanes under consideration was 26,000 ft.; but this statement was qualified by his feeling that, taking into account the advantages of avoiding the complication of special clothes, breathing apparatus, and so on, flight above 16,400 ft. offered no advantages.

In justification of these conclusions, M. Breguet had compiled some very interesting curves substantiated by mathematical formulæ, these being based, as were all subsequent calculations, on a specific consumption of 0.6 lb. per b.h.p./hr., with the proviso, of course, that a reduction in consumption of approximately 0.44 lb. per b.h.p./hr. (a figure already within the bounds of possibility) would result in greater useful loads at higher speeds, or over greater distances.

M. Breguet also calculated the costs of high speed commercial transport, and in this connection stated as one of the advantages of the aeroplane that the expense per mile relative to the power in question does not increase with speed at anything like the same extent at which it does in other means of transport, and that this was an advantage which could not be too strongly emphasised, and which distinguished the aeroplane from all other means of transport.

Summing up, the lecturer's arguments lead to the conclusion that speeds of approximately 200 m.p.h. at an altitude of about 13,000 ft. were now within the bounds of possibility, and would show very great progress if used on routes like the Indian, African, and South American. He considered that it was possible to attain these speeds without detriment on commercial aircraft enterprises, and that the increased revenue which could be expected would make such operation advantageous from the financial point of view.

CORRESPONDENCE

The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.

[2976]—Having *Flight* for November 1 and 8 before me, I wish to comment on some of the views and articles concerning the England-Australia Race.

First, there is the view expressed both by Mr. G. E. Woods Humphrey and Sir Eric Geddes that the policy of mixing passengers and mails benefits both. Sir Eric argues that the more frequent service necessitated benefits both kinds of user of the service. But if dividing the traffic would halve the frequency of the service, why not halve the size of the machines used? The service would then be just as frequent, and the mails could be flown by night, if the ground organisation permitted, without inconveniencing passengers. The design of the aircraft could be more specialised. The smaller types could be designed for greater speed, and would make a more mobile fleet. If a small number were kept in reserve, the service could be more nicely regulated to the loads.

The question of ground organisation leads us to the views expressed by Mr. Handley Page. He advocates development of ground organisation for night flying. Here, again, unless the passengers are to be subjected to the doubtful pleasure of flying day and night, even in the quiet and comfort of one of Mr. Handley Page's cabins, separation is indicated.

Mr. Handley Page also speaks of the necessity for low landing speed, and a steep gliding angle. This implies either that clean, high-speed aircraft with split flaps, etc., should be used, or slow machines comparatively inefficient aerodynamically. If spoilers are not fitted to the former class, the benefits of good speed range are offset by a flat gliding angle. Yet Imperial Airways seem to have abandoned the principle of the

necessity of a low landing speed, for they are adopting for their European and other routes the D.H.86, in which comparatively high speed is accompanied by a flat glide and a landing speed in excess of that of any American commercial aircraft of which I know. [We imagine that this point might be contended.—ED.]

Another point was to be noted in *Flight* of November 1, in the article headed "The Empire Air Routes." In the section dealing with the "Comet's" capabilities as a mailplane, the writer works on the assumption that it would carry as mail a weight representing about two-thirds of the full load of petrol carried in the race. But it must be remembered that during the race, though taking off with full load, the "Comets" never landed except with tanks nearly empty. With the commercial loading envisaged in the article, the "Comets" would be landing with two-thirds full load. Though my views may be somewhat narrow on the subject, I am of the opinion that 65 m.p.h. is the maximum landing speed with which the "Comet" should be operated on the Empire routes, and I cannot think that the "Comet" would land at less than that speed with the payload suggested. A reduction of its wing loading would give better take-off, while being more fully flapped would reduce the landing speed.

As for the necessity for speed approaching that of the "Comet," I would quote Mr. Handley Page: "The speed of the service should be in relation to other competing means of transport." Quite. And if one of the competing means of transport is K.L.M., flying Douglas D.C.2s—?

Stonehaven.

CHARLES BURNS.

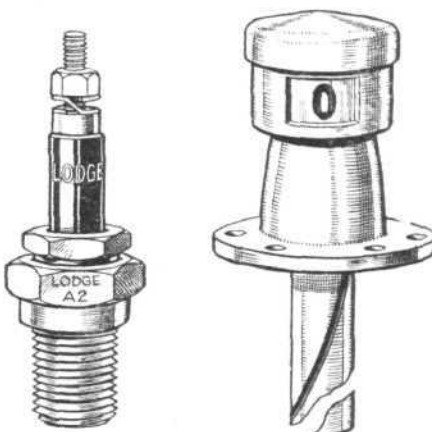
MATERIALS, COMPONENTS and EQUIPMENT

Aeroplanes are far more complicated structures than most people realise, and the number of trades which play their part in their construction is very large: this section gives an idea of the magnitude of the British industry.

Engine Components

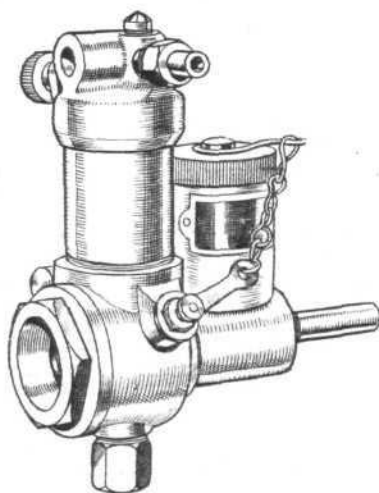
IN keeping with most modern engineering practice, engine designers are relying more and more on firms who specialise in the supply of particular parts of engines made to the maker's designs. For example, we have the Weybridge Engineering Co. supplying camshafts, airscrew bosses and hubs, gudgeon pins, etc. Then there are people like Wellworthy and Brico, whose carefully designed piston rings prevent undue consumption of oil and maintain the cylinder pressure. The elimination of friction has led to the use of ball bearings in many parts of our modern aero engines, and those made by Ransome and Marles are even used for supercharger work, where the bearings may run at 30,000 r.p.m. Another well-known maker in this line is the Hoffman Manufacturing Co., whose needle roller bearings are widely used where there is no room for a roller bearing of the more usual type. After overhaul, aero engines, like any other engines, must have their cylinder-head gaskets and other joints carefully made to ensure many hours of unflinching service. One of the best-known materials for this purpose is Walkerte, supplied by James Walker and Co., of Woking, and in most works such packings are usually treated with Hermeticoll, a compound specially prepared for the purpose by the Patent Motor Products Co.

Sparkling plugs are vital factors in the satisfactory running of aero engines, but



(Left) Lodge sparking plug.
(Right) Sims magnetic fuel gauge.

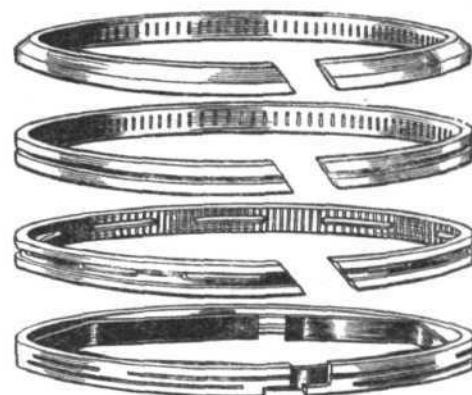
those supplied by Lodge or K.L.G. are never expected to give trouble. Likewise, magnetos now usually function without attention for many hours. Among those frequently seen are B.T.H. Scintilla and Watford, the latter being made by Rotax, at Willesden. The same firm, incidentally, supplies electric starters for engines, thus relieving the pilot of the necessity of turning the airscrew by hand. Carburettors are mostly designed for specific engines, and the "Gipsy Six" engines, which put up such a phenomenal performance



For fuel supply: The Rotherham air-driven pump.

recently, utilised those made by Claudel-Hobson. When flying over desert countries where dust is encountered in large quantities it is always advisable to have some form of air filter as that supplied by Vokes.

Most aeroplanes nowadays have their fuel tanks below carburettor level, and

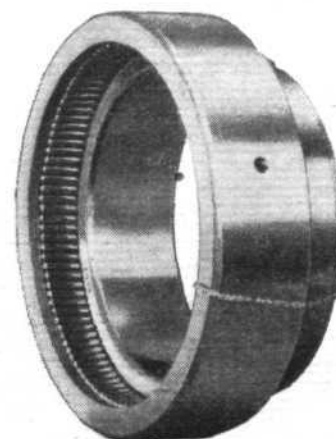


Wellworthy piston rings.

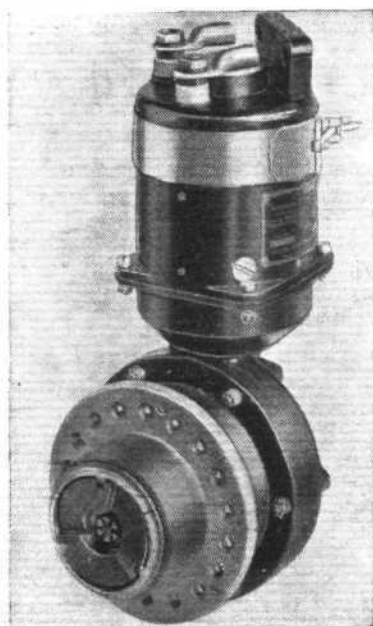
therefore use a type of fuel pump, such as that made by the A.C.-Sphinx Sparking Plug Co. The use of a fuel pump necessitates many connections and unions in the fuel pipe line, of a type which can be obtained from Rotherham and Sons. The fuel itself is generally carried in welded or riveted aluminium or light alloy tanks designed to carry the greatest quantity in the smallest space. Many good examples of this work have appeared from Galloway, Ltd., of Willesden. In order that the pilot can see how much fuel there is in these tanks, various kinds of level indicators have been designed, one of the best-known examples being the Simms magnetic type. Radiators, of great importance in military aircraft where so many water-cooled engines are used, are more often than not made by Serck.

Petrol and Oil

THE needs of aero engines in the matter of fuel and oil vary considerably. Firms like Shell-Mex and B.P., Ltd., National Benzole, and Pratts, with their long experience know this well, and supplies of their fuel are to be found wherever people fly. Others confine themselves to producing the various grades of oil which are necessary, and among these may be mentioned C. C. Wakefield, Silvertown Lubricants, Germ Lubricants, W. B. Dick and Co., Alexander Duckham, and Vacuum



Hoffman needle roller bearing.



The Rotax electric engine starter.

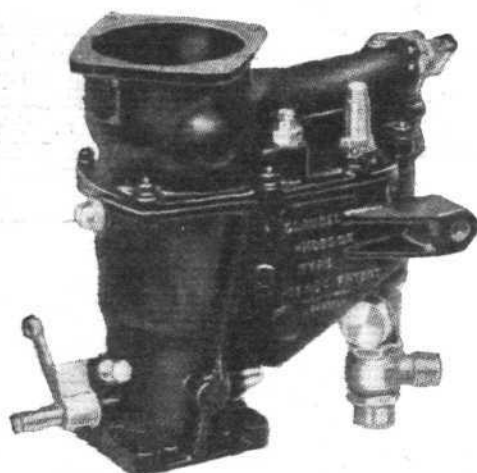
Oil. There are very few aerodromes, particularly in this country, where the products of these companies cannot be found.



Walker "Lion" packings.

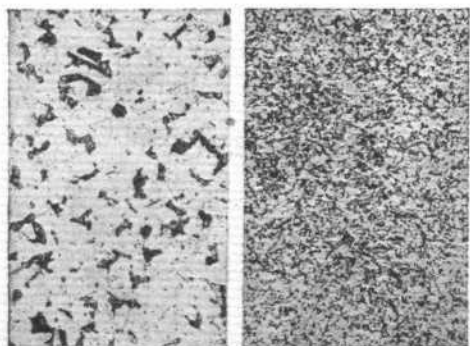
Metal Suppliers

METAL used in aircraft construction can be either ferrous or non-ferrous alloys. The use of the latter is, of course, becoming more general now that metallurgists have discovered how to produce the various alloys of aluminium and magnesium with a strength which was previously thought impossible. Suppliers



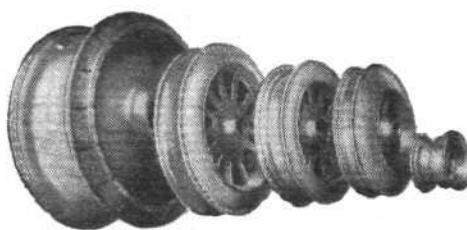
Claudel-Hobson carburettor for "Gipsy" engines.

of metals are extremely numerous as this type of work has always been one of the staple industries of our country. Alclad, a form of sheet wherein a strong aluminium alloy is sandwiched between layers of pure aluminium in order to give the strength of the alloy and the corrosion-resisting properties of the pure aluminium, is supplied by the Northern Aluminium Co. Light Alloys, Ltd., pro-



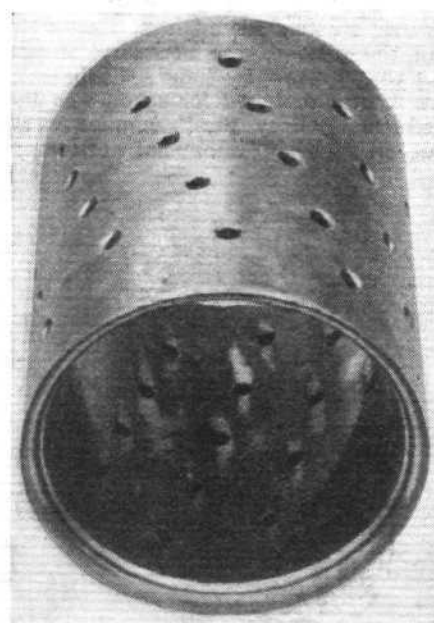
Case-hardening "Brymill" steel: (left) an unrefined core; (right) core after double reheating.

duce an alloy which is sold under the name of Alpax which, by the combination of aluminium and silicon, enables castings free from cracks to be made. High Duty Alloys is a name always associated with the casting of light alloy crank cases for many of our aero engines. Elektron magnesium alloys are even lighter than aluminium alloys, and Sterling Metals, Ltd., are, therefore, finding a steady demand for their products. Magnesium castings from this firm were, for example, used in the De Havilland "Comet" which recently won the MacRobertson race. F. A. Hughes and Co., who are the owners of the British patents concerned with "Elektron" magnesium alloys, also supply this material, as do James Booth and Co., and Birmingham Aluminium Castings.



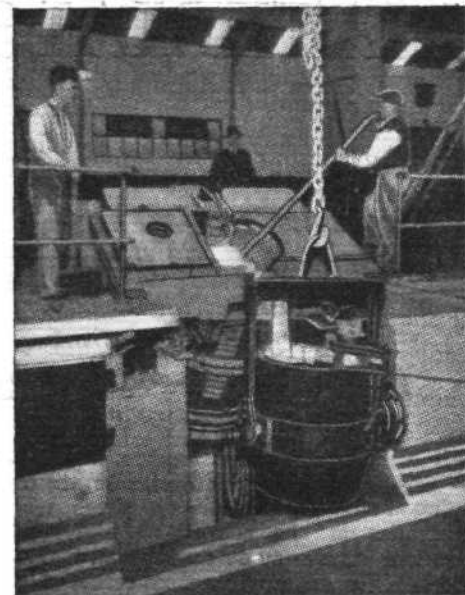
Dunlop Aero wheels cast by Sterling Metals.

Bushes for parts such as control rods are made by Charles Clifford, of Birmingham, who supply phosphor bronze in the form of rods, tubes or bars. Coming to the heavier materials, it is natural to find that steel manufacturers have in the past few years specialised in the production of wonderfully strong alloy steels which allow the aircraft con-



Bristol aero engine bearing lined by Hoyt.

structor to use very small sections without a sacrifice in strength. W. T. Flather, the United Steel Cos., Ltd., Thomas Firth and John Brown, J. J. Habershon, Hadfields, and British Rolling Mills are well known in this connection, while Edgar Allen and Co. produce particularly hard-wearing manganese alloy steel for such parts as the shoes of tail skids. The steel manufacturers



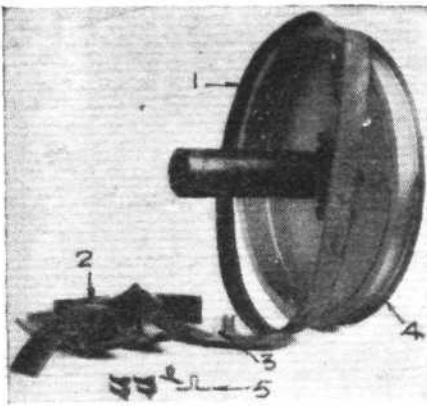
Casting alloy steel in the works of Samuel Fox, of the United Steel Companies, using a high-frequency electric furnace.

do not for the most part make up the steel in the form in which it is used in the aircraft, but pass it on to concerns like Accles and Pollock, and Reynolds, who transform it into tubes of various sizes.

No less important than the aircraft frame itself is the engine, and much research work is carried out with a view to producing stronger and lighter materials so that the engine manufacturers can give aircraft designers more horse-power for a specific weight of engine. Particularly concerned with bearings to withstand the enormous stresses imposed on them in aircraft engines are the Glacier and Hoyt Metal companies. The English Steel Corporation specialise in crankshafts, and the products of their Sheffield works were used in the "Gipsy Six" engines so recently in the news. The valves in this and many other engines are also parts which are extremely highly stressed, but the Kayser Ellison K.E. 965 valves are always up to this work, and while on the subject of valves we must mention the practice of "Stel-liting" valve seat inserts, a method used by the Deloro Smelting and Refining Co. for producing a seat possessing extremely hard-wearing properties.



Palmer one-piece streamline aeroplane wheel made from a single casting in a magnesium alloy.



The Dunlop wheel brake: (1) Inflatable band carrying shoes; (2) which are held in rim (4) by teeth (3) and springs (5).

Wheels and Brakes

WHETHER the undercarriage is retractile or not, wheels are still necessary, and as these wheels need to carry the whole weight of the aeroplane, often when taxiing at high speed over rough ground, they have to be very strong. Consequently it is only with great difficulty that light wheels have been designed. One of the newest of these is that made by the Palmer Tyre Co. This is a disc wheel carrying a well-base tyre and is a single casting of a light alloy, to the specification D.T.D. 59. As it has no bolts, rivets or nuts in its construction, it is probably one of the simplest wheels existent, and shows a large saving in weight over the roller-bearing type. Dunlop is yet



Bendix wheel brake.

another name which has been associated with the supply of wheels and tyres, both of the high and low pressure types, for many years. Both Palmers and Dunlops have their own design of wheel brake, a fitting which is essential in these days of comparatively fast landings. Other firms which also produce brakes suitable for the heavy duty imposed upon them are Bendix and Vickers.

Instruments and Wireless

FLYING through bad weather—and in England such weather is met very often indeed—necessitates the pilot placing implicit reliance in his instru-

ments, and all the pilots on scheduled air lines must be prepared to climb through many thousands of feet of cloud on occasion in order that their passengers may be transported through the smooth upper atmosphere. Numerous instruments are made for this purpose. Thus we have Turn and Bank indicators supplied not only by Smiths Aircraft Instruments, but also by S. G. Brown and Reid and Sigrist, while people like Short and Mason and the Air Log Co. specialise in the many normal instruments such as temperature gauges, pressure gauges and boost gauges. Another development is the gyroscopic automatic pilot which entirely relieves the pilot of the control of the machine when he so wishes. Both Smiths Aircraft Instruments and the Sperry Gyroscope Co. market a form of this control. Another instrument upon which the pilot must

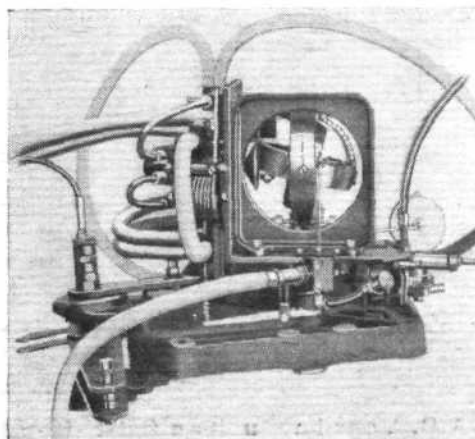


Sperry directional gyro.

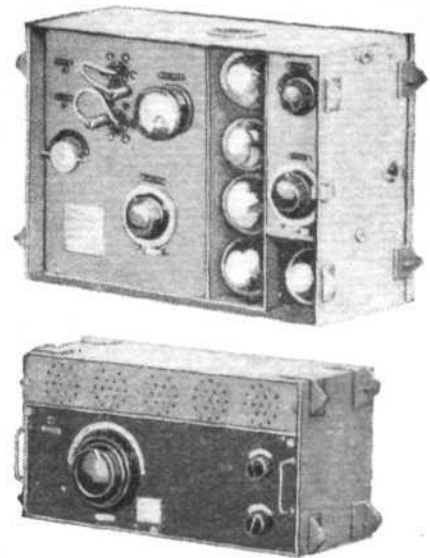
place great reliance is the compass, those made by both Hughes and Kelvin, Bottomley and Baird being amongst the most common. Navigation under bad weather conditions must, if it is to be safe, have the assistance of radio messages as well as that of the previously enumerated instruments. Among the makers of radio apparatus are the Plessey Co., Standard Telephones and Cables, and Marconi's. Each has its particular merits and is used by numerous operators.

Components

BIPLANES are still in fairly general use, and to brace such structures streamline wires and tie-rods are necessary. Every form of wire for this pur-

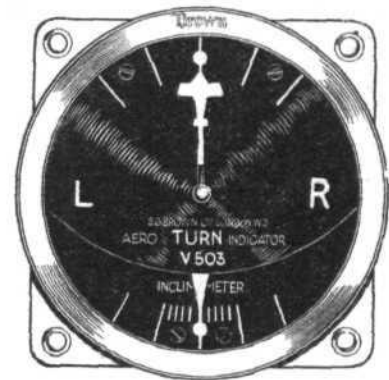


Smith's automatic pilot, which operates in three axes.



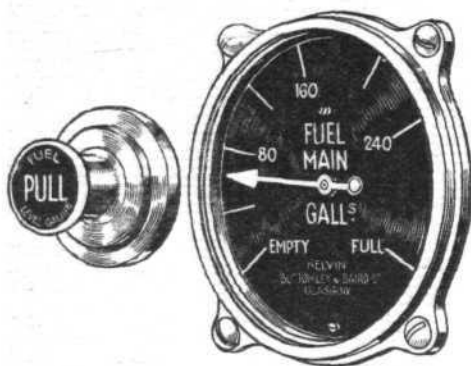
Standard aircraft radio set.

pose can be obtained from Bruntons and Vickers. The number of small parts like bolts, nuts, rivets, screws and turn-buckles which make up that complicated structure called an aeroplane is stupendous, much to the satisfaction of firms like Guest Keen and Nettlefolds, Rubery Owen, Brown Bros., and Alfred Beebe. The design of the airscrew will always, until controllable pitch airscrews become general, be a matter for compromise, but the Aircscrew Co. and Faireys can produce anything that is wanted, whether it be for good take-off or high cruising speed.



Brown Turn Indicator.

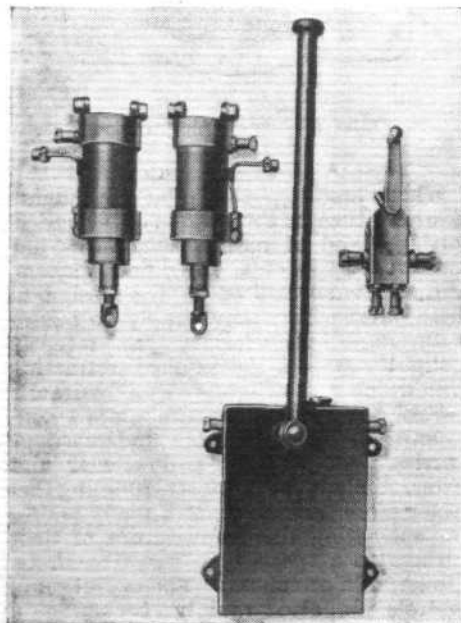
When landing, the pilot's thoughts naturally turn to the makers of his undercarriage, and of recent years firms like Aircraft Components, Ltd., and Vickers, Ltd., have specialised in the design of these parts which they supply to manufacturers. The former has recently brought out a self-contained retracting unit which has a light weight hydraulic control designed to free the aircraft constructor of all retractable undercarriage worries. As aeroplanes fly faster and faster, the question of streamlining becomes more important, and many people are entrusting the manufacture of their fairings to a specialised firm like E. G. Brown, of Tottenham. The operation of controls is also rapidly becoming a specialist job, and is no longer left to become a haphazard arrangement of exposed cables and pulleys. Various forms of self-contained controls like the Exactor hydraulic control and the Arens flexible



K.B.B. fuel contents gauge.

enclosed cable control have recently come on the market. Designers of commercial aircraft realise that the comfort of the passengers is of paramount importance, and L. A. Rumbold and Co. make a specialised job of furnishing cabin aircraft with this end in view. Some people like one kind of upholstery, others another, and one very favourite kind is the "Float-on-Air" made by David Moseley. The supply of cabin furnishings raises the question of smoking, now permitted in aircraft which do not have any petrol tanks in the fuselage, and in which everything is fire-proofed. A very popular form of fire-proof panelling is the synthetic kind made by Bakelite.

Flying by night is becoming quite a regular practice on organised air lines, and, of course, aircraft must be specially equipped for this purpose. Rotax is one of the firms which are well abreast of the supply of navigation lamps, batteries, and so forth. Large flying boats, and perhaps in years to come, very large land machines, are just like ships in that they need to have some form of auxiliary engine to work such things as petrol pumps, oil pumps, water pumps, air compressors, and generators. One of the neatest engines of this nature has been produced by A.B.C. Motors, of Walton-on-Thames, and was, incidentally, fully described in *Flight* for December 1, 1932. The comfort of the pilot

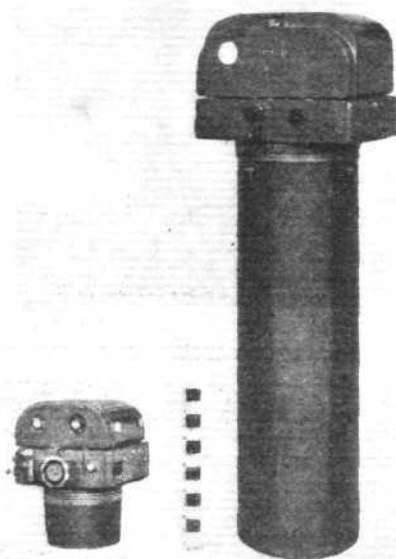


Dowty (Aircraft Components Ltd.) hydraulic undercarriage retracting unit.



Refuelling with Shell at Mersa Matruh in Egypt.

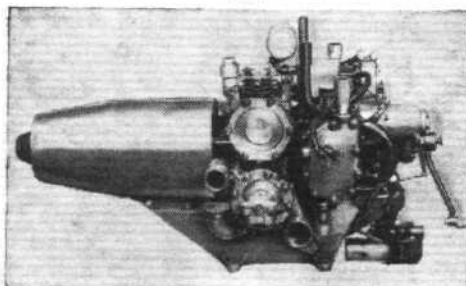
is, of course, of importance, and Auster have made a particular study of wind-screens to achieve this end. Autogiros need carefully machined parts, many of which come from the Mollart Eng. Co.



Long and short focus lenses for Williamson Eagle camera. A scale of inches is shown

Aerial Cameras

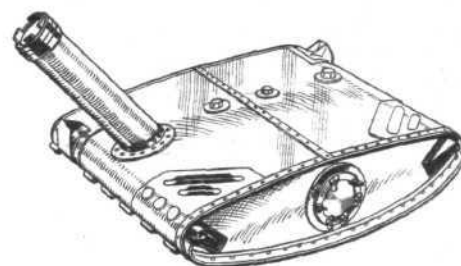
AIR survey is one of the few branches of aerial work which has consistently proved a truly commercial proposition ever since the war. Williamson Manufacturing Co. is a name which every survey operator knows for the supply of cameras specially adapted to this work, while Ilford are equally well known for their special films designed to be used under the peculiar conditions met with when photographing from great heights in the air.



A.B.C. auxiliary unit—a flat-twin engine which drives a fuel pump, oil pump, water pump and air compressor.

Wood

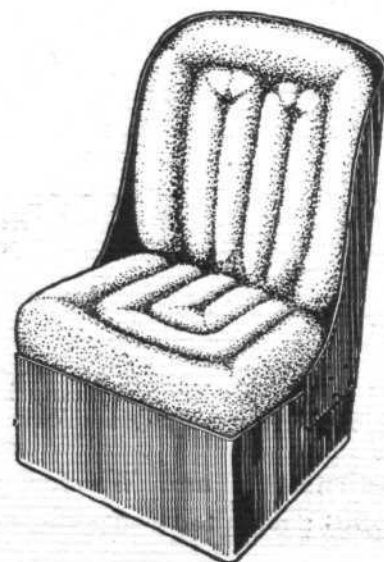
LIGHT alloys and steel have not entirely ousted wood from aircraft factories, as it is still sometimes used for the main structure either in the form of spruce, with doped fabric covering, or as plywood. This latter was the material from which the epoch-making D.H. "Comets" were made. Mallinson, Flexo Plywood and Venesta are all firms known for the supply of this material.



Fuel tank by E. G. Brown.

Dope and Paint

WHETHER aeroplanes are covered with fabric, wood or metal, the question of an exterior finish is always a very important one. Firms like Cellon, Titanine and Nobel Chemical Finishes and J. Hall produce dopes for every occasion, as well as a wide range of protective finishes for the inside of aeroplanes, which not only prevent corrosion but also give a decorative touch to the machine.



Moseley "Float-on-Air" cushion.

THE ROYAL AIR FORCE

Service Notes and News



Air Ministry Announcements

H.M.S. HERMES

The carrier *Hermes* has been commissioned under Capt. the Hon. George Fraser, D.S.O., after completing large repairs. She will replace the *Eagle* on the China Station.

ROYAL AIR FORCE FLYING CLUB

The committee of the above-mentioned club have decided, as a special temporary provision, to waive the payment of an entrance fee for officers of the regular Air Force and Auxiliary Air Force. Details can be obtained from the Hon. Secretary, Royal Air Force Flying Club, Hatfield Aerodrome, Herts.

ELECTRICAL AND WIRELESS SCHOOL OFFICERS' ANNUAL REUNION DINNER

The annual reunion dinner of the officers of the Electrical and Wireless School will be held at the Royal Air Force Club, 128, Piccadilly, W.1, at 7 p.m. for 7.30 p.m., on Saturday, November 17, 1934. Particulars may be obtained from the honorary secretary, J. F. Herd, Esq., M.I.E.E., Ditton Corner, Datchet, Slough.

AIR FORCE LIST

The November issue of the *Air Force List* has now been published. It can be purchased (price 2s. 6d.) from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, London, W.C.2; 120, George Street, Edinburgh; 2, York Street, Manchester; 1, St. Andrew's Crescent, Cardiff; 15, Donegall Square, Belfast; or through any bookseller.

NAVAL AND AIR FORCE EXERCISES

November 1st to 3rd (inclusive), 1934

The following summary of the air operations has been issued by the Air Ministry:—

The Home Fleet under the command of Admiral Lord Cork, and nine Squadrons of the Royal Air Force, commanded by Air Vice-Marshal A. M. Longmore, Air Officer Commanding Coastal Area, have been taking part in a joint training exercise which began at midnight, October 31. The Naval Units were known as the Red Force and their object was to attempt to pass from the North Sea via the Straits of Dover to Portland without being located or attacked in force. The Air Squadrons were named the Blue Force, and their aim was to endeavour to locate, shadow and attack the Red fleet during its passage.

The Red force consisted of the following ships:—3 Capital Ships (Flagship *H.M.S. Nelson*), *H.M.S. Courageous*, 5 Cruisers, 16 Destroyers, and 6 Submarines. On board *H.M.S. Courageous* there were 5 Squadrons of the Fleet Air Arm, namely:—800 (F.F.) Squadron, 802 (F.F.) Squadron, 810 (T.B.) Squadron, 821 (F.S.R.) Squad-

ron, and 823 (F.S.R.) Squadron. The total number of aircraft embarked on *H.M.S. Courageous* was approximately 53, and in addition there were 7 other aircraft borne in Cruisers and Capital Ships.

The Blue Force was comprised as follows, their operational stations at the beginning of the exercise being as shown:—No. 201 (F.B.) Squadron and the Flying Boat Training Squadron, at Calshot; No. 204 (F.B.) Squadron, 209 (F.B.) Squadron, and No. 210 (F.B.) Squadron at Felixstowe; 3 Coast Defence Training Flights and No. 801 (F.F.) Squadron at Gosport; part of No. 811 (T.B.) Squadron and No. 822 (F.S.R.) Squadron at Manston; and part of No. 811 (T.B.) Squadron at Martlesham Heath. The number of Flying Boats was 14, and other aircraft 38, making the strength of the Blue Force 52.

The following summary outlines the air action taken by Air Vice-Marshal Longmore.

At 0515 hours November 1st, six Flying Boats left Calshot and executed a sweep of the English Channel between the Isle of Wight and the French Coast up to the Straits of Dover. At 0715 hours, three destroyers were sighted, and though not connected with the exercise a practice diving bombing attack was carried out when in a position 17 miles south of Selsey Bill. It should be noted that Blue forces are without surface craft, consequently any British war vessels seen in the area of the exercise were regarded as hostile. Continuous patrol was maintained during daylight hours by flying boats across the Straits of Dover. On the afternoon of November 1, five flying boats from Felixstowe carried out a sweep from the Straits of Dover up the North Sea, which, owing to the excellent visibility, ensured that no enemy forces were south of the line of the latitude of Smiths Knoll Light Vessel. It therefore became plain that no Red ships at ordinary cruising speed of advance could reach the Straits of Dover before the early morning of November 2.

Before daylight on the morning of November 2, flying boats from Calshot undertook a similar sweep to that of the day before, again with a negative result. The Dover patrol was continued up to 1400 hours by one flying boat. During the forenoon, one flying boat from Felixstowe on patrol towards Smiths Knoll sighted two submarines at 1145 hours, 15 miles due east of Aldeburgh, thus giving indication of the probable approach of the Red Fleet. The sweep by the Felixstowe boats was repeated again during the afternoon in the same manner as the previous day. Between 1420 and 1500 hours four submarines at various positions were reported, and at 1453 hours a cruiser in a position 39 miles E.N.E. of the Maas Light Vessel was sighted. At 1450 hours three Red Fleet Capital Ships were reported in close proximity to the cruiser, and five minutes later the aircraft carrier *Courageous* was seen. At 1510 hours a signal was made to No. 822 Squadron, already in the air, to attack the enemy carrier. After this signal had been passed successfully to the Squadron and during the time it was en route to the target, it was recalled as a peace time precaution to avoid the 150 miles flight over the sea which would have been necessary before dusk.



THE RETRACTILE FASHION SPREADS: A notable feature of the new Bristol Day and Night Fighter, apart from the cantilever low-wing construction, is the use of a retractable undercarriage. The engine is a Bristol "Mercury."

For war purposes, this attack may be considered as having been carried through. From the time of the sighting of the Red Fleet by the flying boat patrol, the Capital Ships and the Carrier were shadowed and their positions and course reported at regular intervals by two flying boats until 1730 hours, when touch was lost for the time being, and not regained until 2125 hours, when Flying Boat S.1044 from Felixstowe located and reported the Red Fleet two miles north of Sandettie Light Ship, steering a course of approximately 240°. This flying boat, in spite of a very dark night, maintained contact for two hours. During this time, seven aircraft from Manston carried out a night attack on the Fleet. This operation, as well as the shadowing, was made possible by the successful use of parachute flares. Shortly before midnight, Flying Boat S.1044 was recalled to Felixstowe, and air operations ceased for the night.

In the early morning of November 3, flying boats from Calshot were out on the western edge of their sweep before daylight, and submarines were located apparently stationary off the Isle of Wight, probably being used for look-outs. Contact with the Fleet and Carrier was made at 0643 hours in a position 26 miles N.E. of Cape

Barfleur. Shadowing by two flying boats then recommenced. At dawn No. 811 Torpedo Bomber Squadron and No. 822 Fleet Spotter-Reconnaissance Squadron moved from Manston to Gosport. Attacks were made by the Coast Defence training flights and No. 822 Squadron between 0700 and 0800 hours, on the Aircraft Carrier *Courageous*. This Carrier was then regarded as no longer the first objective. The officer in command of the striking force at Gosport was then ordered to carry out continuous attacks with all available aircraft on the Capital Ships, allowing reasonable intervals on the ground for refuelling and re-arming of the aircraft concerned. At this time these were No. 811 Torpedo Bomber Squadron, No. 822 Fleet Spotter-Reconnaissance Squadron, and the Coast Defence flights. No. 801 Squadron employed six aircraft on patrol and later for attacking the enemy fighters from the aircraft Carrier.

At 0916 hours all flying boats were recalled from patrol and contact with the Fleet was maintained by the succession of attacking Squadrons from Gosport. Operations ceased at 1045 hours.

It should be noted that this exercise was a purely training exercise and that air operations were aided by the generally good visibility both by day and night.

ROYAL AIR FORCE GAZETTE

London Gazette, November 6, 1934

General Duties Branch

The following are granted short service commissions as Acting Pilot Officers on probation with effect from and with seny. of October 19:—A. G. G. Baird, R. D. Blair, A. C. Brown, F. S. D. Burgis, A. A. Case, A. J. F. Churchill, R. N. Cook, M. P. C. Corkery, R. I. K. Edwards, R. M. Elms, T. A. N. Forsyth, C. F. Herington, F. H. Hitchcock, T. S. Jameson, M. M. Kane, C. F. King, C. Kirkley, H. R. Larkin, J. R. Maling, F. L. Newall, B. L. Powell, A. E. Saunders, S. R. R. Smith, P. Stevens, H. T. Sutton, J. M. M. Thompson, N. R. L. Urquhart, K. M. M. Wasse, D. C. Yorke.

The following Acting Pilot Officers on probation are confirmed in rank and graded as Pilot Officers (September 1):—H. V. Alloway, S. S. Bertram, A. P. W. Cane, K. Capel-Cure, E. L. Colbeck-Welch, L. P. Gibson, G. E. Jackson, V. H. A. McBratney, A. M. Mulliken, C. R. Paylor, B. V. Robinson, E. U. G. Solbé, G. J. D. Thomson, R. H. Waterhouse.

The following Acting Pilot Officers on probation are graded as Pilot Officers on probation (September 2):—C. A. H. Evans, P. H. R. Saunders.

The following Flying Officers are promoted to the rank of Flight Lt.:—C. E. Hartley (October 2); E. H. Bellairs, M. E. M. Perkins, R. Todd (October 13); H. L. Messiter (October 14).

The following Pilot Officers are promoted to the rank of Flying Officer:—W. D. Anderson, A. J. Biggar (October 1); E. C. Kidd, A.F.M. (October 10); H. G. Lee (October 21).

Sqd. Ldr. F. Workman, M.C., is placed on the retired list (November 1); Flt. Lt. W. G. E. Hayman is placed on the retired list (November 7); F/O. R. D. Williams is placed on the retired list on account of ill-health (November 1); F/O. E. M. Morris is transferred to the Reserve, class A (November 6); F/O. D. Scorgie is dismissed the Service by sentence of General Court Martial (October 29).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Group Captain.—W. A. McClaughry, D.S.O., M.C., D.F.C., to Station Headquarters, Heliopolis, 12.10.34. To command. F. P. Don, O.B.E., to Special Duty List, 1.10.34. On appointment as Air Attaché, Berlin, vice Wing Com. J. H. Herring, D.S.O.

Wing Commander.—J. H. Herring, D.S.O., M.C., to Headquarters, Central Area, Abingdon, 1.11.34. For duty as Senior Personnel Staff Officer vice Wing Com. T. F. W. Thompson, D.F.C.

Squadron Leaders.—W. A. K. Dalzell, to No. 824 (F.S.R.) Squadron, Upavon, 28.10.34. To command. C. J. S. Dearlove, to No. 28 (Army Co-operation) Squadron, Ambala, India, 24.9.34. To command vice Wing Com. F. Fernihough, M.C. C. Findlay, D.F.C., to No. 9 (B) Squadron, Boscombe Down, 2.11.34. For flying duties vice Sqd. Ldr. E. B. Grenfell, A.F.C.

Flight Lieutenants.—R. J. Carvell, to No. 28 (Army Co-operation) Squadron, Ambala, India, 27.10.34. R. Costa, to Aircraft Depot, India, Karachi, 27.10.34. A. F. Hutton, to No. 5 (Army Co-operation) Squadron, Quetta, India, 27.10.34. J. E. MacCallum, to No. 2 Flying Training School, Digby, 29.10.34. G. H. Huxham, to No. 31 (Army Co-operation) Squadron, Quetta, India, 28.9.34. J. Constable-Roberts, to No. 2 Flying Training School, Digby, 1.11.34. F. Kirk, to D.T.D. Dept. of Air Member for Supply and Research, Air Ministry, 1.11.34. C. R. Lousada, to No. 28 (Army Co-operation) Squadron, Ambala, India, 8.10.34. R. J. O. Bartlett, to No. 17 (F) Squadron, Kenley, 20.10.34. L. C. Bennett, to Station Headquarters, Worthy Down, 3.11.34.

Flying Officers.—F. C. Cole, to No. 20 (Army Co-operation) Squadron, Peshawar, India, 27.10.34. F. R. Drew, to R.A.F. Base, Calshot, 31.10.34. P. R. J. Leborgne, to Electrical and Wireless School, Cranwell, 1.11.34. W. C. Pitts, to Air Armament School, Eastchurch, 20.10.34. R. K. Brougham, to No. 100 (B) Squadron, Singapore, 13.10.34.

Pilot Officers.—D. W. H. Gardner, to No. 11 (B) Squadron, Risal-

Stores Branch

The following Flying Officers are promoted to the rank of Flight Lt. (October 15):—C. Thripp, H. W. Penney, E. F. Smith, M. M. McMullan, H. J. Butler, H. A. Wrigley, T. A. Head.

Flying Officer on probation R. D. Williams reverts to the General Duties Branch (October 31).

Dental Branch

F/O. C. R. Stone, L.D.S., is promoted to the rank of Flight Lt. (October 31).

Legal Branch

H. H. M. Shurlock is granted a permanent commission as Flight Lt. with effect from and with seny. of October 22.

ROYAL AIR FORCE RESERVE

Reserve of Air Force Officers

General Duties Branch

W. Dawson, M.B.E., is granted a commission as Flying Officer in Class C (October 26); F/O. A. I. A. McDougall is transferred from class AA (ii) to class C (June 19); Flt. Lt. J. H. C. Harrold is transferred from class B to class C (November 2); Pilot Officer on probation P. B. Powell is transferred from class C to class AA (ii) (October 22); the notification in the *Gazette* of August 21 concerning F/O. L. B. McGovern is cancelled.

Stores Branch

F/O. C. P. Marshall relinquishes his commission on completion of service (August 10).

Medical Branch

Flt. Lt. G. T. O'Brien, L.R.C.P. and S., relinquishes his commission on completion of service (September 8).

pur, India, 27.10.34. A. C. Mills, to No. 28 (Army Co-operation), Squadron, Ambala, India, 27.10.34.

Stores Branch

Wing Commander.—F. G. M. Williams, to Aircraft Depot, India, Karachi, 27.10.34. For Stores duties vice Wing Com. W. J. B. Curtis, O.B.E.

Flight Lieutenant.—C. W. Rugg, to Headquarters, R.A.F., India, New Delhi, 27.10.34.

Flying Officers.—F. B. C. Fundrey, to Aircraft Park, India, Lahore, 27.10.34. C. H. E. Lyster, to No. 5 (Army Co-operation) Squadron, Quetta, India, 27.10.34. M. J. Scott, to Station Headquarters, Duxford, 1.11.34.

Accountant Branch

Wing Commander.—A. G. N. Belfield, O.B.E., to Home Aircraft Depot, Henlow, 25.10.34. For Accountant duties vice Wing Com. H. F. Fuller.

Medical Branch

Squadron Leaders.—F. E. Johnson, to Station Headquarters, North Weald, 29.10.34. For duty as Medical Officer. J. Parry-Evans, to Central Medical Establishment, 1.11.34. For duty as Medical Officer.

Flight Lieutenant.—P. H. Perkins, to Headquarters, R.A.F. Middle East, Cairo, 1.10.34.

Flying Officer.—I. Mackay, to No. 1 School of Technical Training (Apprentices), Halton, 29.10.34.

Legal Branch

Flight Lieutenant.—H. H. M. Shurlock, to Special Duty List, 22.10.34. For Legal duties in the Office of the Judge Advocate General, on appointment to a permanent commission.

Chaplains Branch

Rev. T. M. Jones, to Home Aircraft Depot, Henlow, 1.11.34. For duty as Chaplain (Presbyterian).

COMMERCIAL AVIATION

— AIRLINES — AIRPORTS —

CROYDON

*Silken Merchandise : Service : Gale Warning : "The Old Order Changeth" :
Winter Passengers : More in a Lifetime*

LAST week's air thrill was the alleged descent of certain intimate silken garments, of what Mr. Squeers would have called "the female gender," from an aeroplane on to a steamer deck.

According to the movements of machines at that time of day, it was either a K.L.M. or Luft Hansa machine, but neither company missed a parcel.

Thus, it must have been the unobserved act of a passenger. Why any such property should have been jettisoned is a difficult question to answer, but the matter is not so amusing as it may seem. With certain types of aeroplane these silk garments might have caught in the controls.

I hear that the charter of machines by Railway Air Services, Ltd., from Spartan Air Lines, Ltd., for the Isle of Wight service, which was so successful last summer, is now ended and will not be renewed until next spring. "Spartans," however, will attempt to run the service through the winter, which will certainly be to the advantage of R.A.S., Ltd., next year, as continuity of any service offered to the public is most important.

Olley Air Service, Ltd., had a charter last week which must have broken most records. A passenger was brought from the boat at Cherbourg to his hotel in London in 1½ hours. The accent, in this case, is on the word "service."

Mrs. F. Kerr-Wilson, O.B.E., owner of the very successful Wilson Airways, Ltd., mentioned by Sir Eric Geddes at the Imperial Airways' general meeting as "that very enterprising lady," left Croydon for Nairobi during the week in a "Dragon" piloted by Mr. N. C. P. Mostert.

Mrs. Mollison arrived from Holland by K.L.M. on Friday and Lady Londonderry, with her two daughters, left for Belfast by Railway Air Services, Ltd. The visit was to their country seat Mount Stewart, which shows that you can spend a week-end on the other side of a large stretch of water without loss of time or inconvenience of travel.

The newspaper spoke of a gale in the Channel on Saturday

and of four liners (but not *air* liners) which were unable to take their pilots aboard and had to heave to. Some ten years ago I remember telling a circle of shipping people that the aeroplane would be a more regular and reliable means of transport than the ship and being heartily laughed at for my pains. Saturday's air services operated as usual, of course.

Sir John Salmond, Government Director of Imperial Airways, Ltd., left for Singapore by I.A., Ltd., on Saturday. It is said that he is to make a tour of inspection of ground organisation between Singapore and Australia.

The new Polish Ambassador came in by Luft Hansa, earlier in the week, to present his credentials, and the retiring Ambassador left by boat. "The old order changeth," and few of the younger diplomats can brook the slow, wearisome sea voyage in these days.

Air France had a sudden "gold rush," carrying about a ton and a half from Paris. This was, however, not the advance guard of a period of activity in gold transport, but an isolated consignment. Mr. Anthony Fokker arrived on Monday by K.L.M.

Passenger figures are still favourable for the time of year, and long-distance passengers, who used to be rare in winter, are travelling more than ever. Last Sunday's K.L.M. machine out from Croydon had seven Berlin passengers and three Scandinavian out of seventeen.

The argument is not infrequently put forward that people are no better off for "all this speed" and that the stage coach and sailing packet got there just as quickly as was possible in those days, so that, having no faster means of transport to compare it with, everybody was content. "Why," say the apostles of stagnation, "should I travel to Paris at close on 200 m.p.h. and what real good does it do me?"

The answer is that, for pleasure or business, flying is only a means of getting more done in a lifetime and a means, occasionally, of saving valuable life—e.g., when it is a question of transporting a specialist to a patient.

A. VIATOR.

JERSEY AIRWAYS' NEW FLEET

Six D.H.86 Four-engined Machines to be put into Operation Next Year : Jersey Airways Excellent Traffic Figures

SOME months ago it was stated in *Flight* that one of our most successful unsubsidised operating companies, Jersey Airways, Ltd., would be putting D.H. 86's into service.

Last week an order was placed with the De Havilland company for six of these machines, which will each carry fourteen passengers, and which are to be equipped with all the latest aids to navigation.

Once or twice since the Jersey line was opened the D.H. "Dragons" have reached their objective safely on one engine, and the new machines should completely remove any possibility of failure over the long sea crossing, for they can fly fully loaded on any two of the four Gipsy Six engines fitted. Cruising at 145 m.p.h., the D.H.86's will reduce the time for the Heston-St. Helier journey to something rather less than an hour and a half.

Jersey Airways, Ltd., under the management of Mr. W. L. Thurgood, a coach operator and bodybuilder, started operations between Portsmouth and St. Helier on December 18, 1933, and between Heston and St. Helier on January 28 this year.

Since that time the fleet has been increased from one D.H. "Dragon" to eight, and something like a thousand passengers

were carried every week during the summer season. During the month of August alone the figure reached 4,500, and even now an average of more than 250 passengers are carried every week on the single daily service each way. At the end of last month, 18,530 passengers had been carried since the service started.

The wide stretch of sand in St. Aubin's Bay is at present used as a landing ground—a fact which tends to make the timetable a troublesome one—but in due course an aerodrome will be laid out near the racecourse at St. Helier. In the meantime, the new machines will require rather more landing space, and Mr. L. T. H. Greig, the Jersey manager, will have a difficult task in seeing that the sands are really and truly clear of possible airscrew victims.

The purchase of the new fleet, which involves a sum of something like £50,000, has been made possible through the additional capital obtained by arrangement with the Whitehall Securities Corporation. If 1935 is as successful a year, in proportion, as 1934, the backers should receive value for their money. There is no reason why it should not be, for Jersey Airways are well known and have had a trouble-free season.

HESTON

The Upward Trend : A Collapsible Hangar : Wireless and Landing Headlights for L.S. and P.A. : A Kenya Company

A "TREND curve" is a graph indicating the trend of statistics on a twelve-month basis, independent of daily, monthly or seasonal fluctuations. This comforting piece of pencilwork is reassuring when the slight drop in flying activity is noticed.

To give a few figures for the month of October: 1,984 take-offs or landings were made during the "controlled" hours between 10 a.m. and sunset, quite apart from those by school aircraft. Jersey Airways, alone, carried 440 passengers between Heston and Jersey; 129 commercial aircraft, 49 private aircraft and 469 passengers cleared customs. Only 90 aircraft in all cleared customs in October, 1933, and the increase is significant; though October figures this year show a pronounced drop on those of September, largely owing to the cessation of B.A.N.C.O.'s summer services to French coastal resorts. Weather also had something to do with it, for 19 good flying days are recorded in October as against 23 in September.

Messrs. I. and J. Hyman are exhibiting at Heston a practical solution of the difficulty of temporary or permanent hangarage on private landing grounds. Their product (the price of which is in the vicinity of £40) has an appearance resembling something between a partially-deflated dirigible and a refreshment marquee. It is a large canvas tent, with a minimum of stiffening structure and is, consequently, easy to erect, fold and transport. It is secured by guy-ropes, and has already ridden out half a gale in its new Heston anchorage. Time will show whether its wind-resisting qualities are really permanent, and meanwhile it appears a useful novelty. There is approximately 60 ft. by 38 ft. of available space, sufficient to house two folded D.H. "Dragons" with room to spare.

An Airspeed "Courier," belonging to London, Scottish and Provincial Airways, tested its new Vickers-Armstrong landing

lights in flight a few days ago. These lights are set in the leading edge of the wing, and are estimated to illuminate the ground 200 yards ahead at the moment of flattening out. The "Courier" first took off by the Chance-Airwork shadow-bar floodlight, which was afterwards switched off at a prearranged signal. The machine then landed successfully by its own lights, took off again by them and made one more landing, all without further assistance from the floodlight. The tests were entirely successful, and work is proceeding on the gradual equipment of all this company's aircraft with the same type of landing light, in addition to Standard A.T.R.4 wireless installations and blind flying equipment.

Mr. Norman Turner left Heston for Kenya on November 8 with his wife and Mr. Val Meadway, who is joining him as a commercial pilot. They are flying in a new Waco cabin biplane, VP-KBO, which will be added to the fleet of three Wacos already owned by his company, the East African Airways Co., Ltd., Nairobi. This company holds the lease of several aerodromes in Kenya, at which it operates repair depots and charter services. It is probable that Mombasa will shortly be added to these. The company now contemplates experimental airline operation between Nairobi and Kisumu. A ground engineer has been sent out by sea to Egypt, where they will pick him up and take him on to Kenya by air.

On November 7, Heston was free from the fog which enveloped part of the London area, and flying instruction was carried on all day. The Southall gasometer, always a reliable gauge of fog density, was plainly visible $1\frac{1}{2}$ miles away. A Railway Air Services D.H. 86, which required to be tested before departing on its scheduled flight to Liverpool and Belfast, flew to Heston to pick up mails, in order to avoid a landing under the fog conditions at Croydon.

A Reading Appointment

Flt. Lt. T. Rose has been appointed Sales Manager to Phillips and Powis, as from January 1.

Royal Aeronautical Society Lecture

The lecture before the Royal Aeronautical Society on December 6 next will be given by Mr. R. P. Alston on "Flaps and Other Devices as Aids to Landing." The lecture by Senor de la Cierva, originally fixed for that date, will be delivered in the second half of the session.

B.A.N.C.O. and Brighton

The British Air Navigation Co., Ltd., announce that they have been granted a long lease of the new Brighton, Hove and Worthing municipal airport which is to be opened next June. Although the new aerodrome will be their headquarters, a London terminal will be maintained.

The Channel Island Service

A working agreement has been reached between Spartan Air Lines, Ltd., and Jersey Airways, Ltd., whereby the two companies will co-operate and thus avoid competition over certain routes, including that to the Channel Islands.

Mr. R. C. A. Monk, incidentally, who ran an amphibian machine between Blackpool and the Isle of Man for two seasons, is with Spartan Air Lines.

Surveying the Pacific Route

It is understood that Mr. C. T. P. Ulm, who until very recently held the record between Australia and England, is to make a survey flight between Canada and Australia.

He will use an Airspeed "Envoy" fitted with two 215 h.p. "Lynx" engines which has recently been completed at Portsmouth. According to the range discovered by test flights, the route will be either from Vancouver to San Francisco, Honolulu and Suva—such as was taken by Sir Charles Kingsford Smith—or by way of Honolulu, Fanning Island, Suva and New Zealand.

Mr. Ulm will be accompanied by Mr. G. M. Littlejohn, of the N.S.W. Aero Club, and by Mr. J. L. Skilling, who will act as navigator and wireless operator.

The Tanker Tragedy

Maj. Cooper, Air Ministry Inspector of Accidents, giving evidence recently at the inquest on the four victims of

the accident at Aylesbury to the Handley Page W.10 refuelling machine which occurred on September 22 last, expressed his opinion that the accident was caused by the fracture of a bolt. This bolt, he said, secured the bracing wires of the front spar of the tailplane, and he considered the fracture occurred in normal flight, and as a result of the failure the pilot was deprived of control. The fracture of the bolt was typical of failure by fatigue. Apparently, a fuel lorry had damaged the tail at Frinton, but this had been refitted and examined. A verdict of accident death was returned.

INCREASES OF CAPITAL

MIDLAND AIRWAYS LTD. (Bridge Street Chambers, Northampton). The nominal capital has been increased by the addition of £400 in £1 ordinary shares beyond the registered capital of £100.

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NEW COMPANY

FLIGHT REFUELLING LIMITED. Nominal capital, £1,000 in £1 shares. The objects are to acquire from Sir Alan J. Cobham, K.B.E., A.F.C., any letters patents or patent rights relating to refuelling aircraft whilst in flight, and to advise air transport companies and aircraft operators and owners, to manufacture aircraft and aerial tanker flying machines, etc. The subscribers (each with one share) are:—Sir Alan J. Cobham, Little Park Hill, Bletchingley, Surrey, aviation consultant; Gladys Cobham, Little Park Hill, Bletchingley, Surrey. Sir Alan J. Cobham is permanent director. Solicitors: Kenneth Brown, Baker, Baker, Essex House, Essex Street, Strand, W.C.

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PUBLICATIONS RECEIVED

Hitler Rearms. Edited by Dorothy Woodman. Price 10/6 net. London: John Lane The Bodley Head Ltd.

Through Atlantic Clouds. The History of Atlantic Flight. By C. W. Collinson and Capt. F. McDermott. Price 18/- net. London: Hutchinson & Co.

Magnesium Alloys with special reference to Elektron. Second Edition, 1934. London: British Elektron Group.

The Principles of Motor Fuel Preparation and Application. By Alfred W. Nash and Donald A. Howes. Volume I. Price 30/- net. London: Chapman & Hall.

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AERONAUTICAL PATENT SPECIFICATIONS.

Abbreviations: Cyl = cylinder; i.c. = internal combustion; m. = motors. (The numbers in brackets are those under which the Specification will be printed and abridged, etc.)

APPLIED FOR IN 1933.

Published November 15th, 1934.

28722. BECKER, W. A. and SCHLESINGER, DR. H. Frame structures for vehicles, marine vessels, and aircraft. (418,250.)

8400. PERRIN, E. A. Air-screw propellers or the like. (418,109.)

15676. DORNIER, C. Aircraft. (418,121.)